

AMENDMENT TO ENVIRONMENTAL/CRZ CLEARANCE FOR KATTUPALLI SHIPYARD CUM PORT

at Kattupalli Village Thiruvallur District, Tamil Nadu

Submitted by



L&T SHIP BUILDING LIMITED



**UPDATED FORM 1 FOR AMENDMENT IN ENVIRONMENTAL/CRZ
CLEARANCE FOR EXTENSION OF DREDGE SPOIL DISPOSAL SITE**

March 2015

Prepared By



*L&T Infrastructure Engineering Limited
(formerly known as L&T-Ramboll Consulting Engineers Limited)*

C1141307
RP002, Rev 0



L&T Infra Engineering

L&T Infrastructure Engineering Ltd.

Client: L&T Shipbuilding Limited

Project: Amendment to Environmental/CRZ Clearance for Kattupalli Shipyard cum Port

Project No.: C1141307

Title: Updated Form 1 for Extension of Dredge Spoil Disposal Site

Document No.: RP002

Rev.: 0

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1.

Revision Details:

Rev.	Date	Details	Prepared	Checked	Approved
0	25.03.2015	First Submission	SNV Init. <i>CV</i> Sign. <i>CV</i>	BRT Init. <i>B</i> Sign. <i>B</i>	CVS Init. <i>CVS</i> Sign. <i>CVS</i>

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LIST OF ENCLOSURES

Dredge Spoil Disposal Study Report is given as a standalone document.

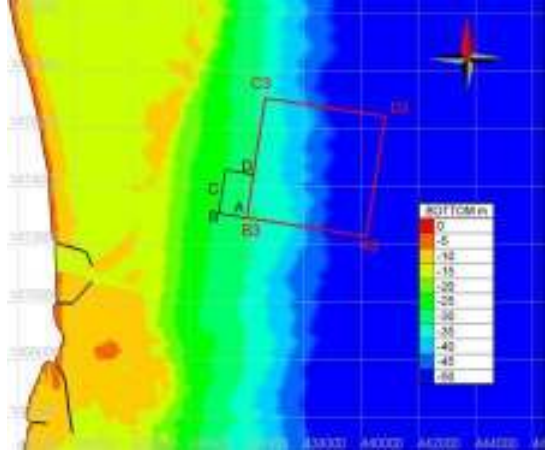
Updated Form - 1

FORM 1

1 Basic Information

S. No.	Item	Details
1.	Name of the Project	Kattupalli Shipyard cum Port <i>Application is for Amendment in Environmental/CRZ Clearance for extension of Dredge Spoil Disposal Site.</i>
2.	S. No. in the schedule	Activity 7(e)
3.	Proposed capacity/area/length/tonnage to be handled / command area/lease area/number of wells to be drilled	<ul style="list-style-type: none"> • No Change in Project Configuration/Capacity/area/ Handling Tonnage/ Dredging quantity etc., • Kattupalli Shipyard Cum Port Consists of Shipyard, Port and Modular Fabrication Facility (MFF). Shipyard is layout is designed for about 25 ship building/ annum and 60 ship repair/ annum. Port layout is designed to handle about 24.65 MTPA of cargos such as Containers, Ro-Ro (nos), Project Cargo, Break Bulk/general cargo (Barytes / Gypsum / Limestone / Granite / Steel Cargo), Edible oil, CBFS, Base Oil, Lube Oil and Non- Hazardous Liquid Cargo. MFF layout is designed with a capacity of about 50,000 MT/Annum of Modular fabrication. • Environmental and CRZ clearance was obtained in July 03, 2009 and copy of EC/CRZ clearance and its latest compliance report submitted to MoEF, regional office are given as Appendix A. • In addition, CRZ/EC validity Extension for the facilities yet to be developed at Shipyard/Port/MFF including future dredging¹ and amendment for Revised Port traffic was also obtained recently vide Letter No: F.No. 10-130/2007-IA.III dated December 17, 2014. The same was given as Appendix B. The facilities developed (shown in Grey colour) and yet to be developed (shown in Colour) for Shipyard, Port and at MFF are given as Appendix C. • Present proposal is for <u>Amendment in Environmental/CRZ Clearance for extension of Dredge Spoil</u>

¹ The requirement of Future Dredging is given in both EIA report and Updated Form 1 submitted for CRZ/EC validity Extension.

S. No.	Item	Details																												
		<p>Disposal Site only.</p> <ul style="list-style-type: none"> As the existing disposal site (1.0x1.5 km) is designed to accommodate 1.5 MCM to 2.0 MCM (initial phase Dumping) and proposed dumping at this site will make the area shallower, an extended disposal site is proposed to accommodate the future disposal quantities. The Old and proposed extended Dredge Spoil Disposal Site co-ordinates are given below. <table border="1" data-bbox="911 633 1441 786"> <thead> <tr> <th></th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Old Site</td> <td>13°19'22"</td> <td>13°19'27"</td> <td>13°20'11"</td> <td>13°20'16"</td> </tr> <tr> <td>80°24'33"</td> <td>80°24'00"</td> <td>80°24'41"</td> <td>80°24'08"</td> </tr> <tr> <th></th> <th>A3</th> <th>B3</th> <th>C3</th> <th>D3</th> </tr> <tr> <td rowspan="2">New Site</td> <td>13°19'0.17"</td> <td>13°19'22.04"</td> <td>13°21'37"</td> <td>13°21'15.13"</td> </tr> <tr> <td>80°26'50.71"</td> <td>80°24'32.90"</td> <td>80°24'55.22"</td> <td>80°27'13.05"</td> </tr> </tbody> </table>  <p>The dumping is proposed to be carried out in the following manner.</p> <ul style="list-style-type: none"> Immediate Dumping (Mid of 2015) of about 2.5 MCM from dredging the MFF Area (from (-) 6 m to (-) 12 m) Dumping of 2.5 MCM (2016-17) from the dredging the same MFF Area (from (-) 12 m to (-) 15 m). <p>Apart from above the following are other dumping requirements which will be carried out in a phased manner based on the business growth within 5 years as approved in CRZ/EC Validity extension application.</p> <ul style="list-style-type: none"> Dumping of 5.0 MCM from dredging the Shipyard Area (from 10 m to 15 m) in a phased manner depends on the business requirement. Dumping of 6.0 MCM from dredging 		A	B	C	D	Old Site	13°19'22"	13°19'27"	13°20'11"	13°20'16"	80°24'33"	80°24'00"	80°24'41"	80°24'08"		A3	B3	C3	D3	New Site	13°19'0.17"	13°19'22.04"	13°21'37"	13°21'15.13"	80°26'50.71"	80°24'32.90"	80°24'55.22"	80°27'13.05"
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S. No.	Item	Details
		of Port areas from (-) 14.0 m to (-)16.7 m and Navigation Channel from (-)14.0 m to (-)17.5 m as per Master Plan depends on the business requirement.
4.	New/Expansion/Modernisation	Amendment in Environmental/CRZ Clearance for extension of Dredge Spoil Disposal Site
5.	Existing Capacity/Area, etc	Kattupalli Shipyard Cum Port land area is about 1200 acres.
6.	Category of Project i.e., 'A 'or 'B'	A (as an entire project)
7.	Does it attract the general condition? If yes, please specify	No
8.	Does it attract the specific condition? If yes, please specify	No
9.	Location	Shipyard cum port is located on the coastal side of Kattupalli village in Ponneri Taluk of Thiruvallur district, Tamil Nadu. The geographic location of the project is at Latitude 13 ⁰ 18' 57.26" N and Longitude 80 ⁰ 20' 45.68" E Location map of the Kattupalli port is attached as Appendix D .
	Plot/Survey/Khasra No.	Survey Nos covered under the Project area is provided in Appendix E .
	Village	Kattupalli
	Tehsil	Ponneri
	District	Thiruvallur
	State	Tamil Nadu
10.	Nearest railway station/ airport along with distance in km	Railway Station: Attipattu, 5.8 km Airport: Chennai airport, 35 km
11.	Nearest town, city and district head quarters along with distance in km	Town: Minjur, 9 km City: Chennai, 20 km District Headquarters: Tiruvallur, 50 km
12.	Village Panchayats, Zilla Parishad, Municipal Corporation, Local body (complete postal addresses with telephone nos. to be given)	Kattupalli village, Ponneri Taluk, Thiruvallur district
13.	Name of the applicant	L&T Shipbuilding Limited
14.	Registered Address	Kattupalli Village, Ponneri Taluk, Tiruvallur District, Pin Code: 600 120 Tamil Nadu, India
15.	Address for correspondence:	Kattupalli Village, Ponneri Taluk, Tiruvallur District, Pin Code: 600 120 Tamil Nadu, India
	Name	Col(Retd) Gopinath Menon
	Designation (Owner/Partner/CEO)	Head Central Services

S. No.	Item	Details
	Address	Kattupalli Village, Ponneri Taluk, Tiruvallur District, Pin Code: 600 120 Tamil Nadu, India
	Pin code	600 120
	E-mail	gopinath.menon@larsentoubro.com
	Telephone No	044 - 33464180
	Fax No	044 - 33464100
16.	Details of Alternative Sites examined, if any. Location of these sites should be shown on a Toposheet.	Not Applicable
17.	Interlinked Projects	Nil
18.	Whether separate application of interlinked project has been submitted	Not Applicable
19.	If yes, date of submission	-
20.	If no, reason	-
21.	Whether the proposal involves approval/clearance under: <ul style="list-style-type: none"> • The Forest (Conservation) Act, 1980 • The Wildlife (Protection) Act, 1972 • The CRZ Notification, 2011 	This proposal is for an Amendment in Environmental/CRZ Clearance for extension of Dredge Spoil Disposal Site only. Already Environmental/CRZ clearance under relevant Notifications and extension of CRZ/EC validity for the facilities yet to be developed including dredging has been obtained vide MoEF Letter No: 10-130/2007-IA.III dated July 03, 2009 (refer Appendix A & B).
22.	Whether there is any Government order/policy relevant / related to the site?	-
23.	Forest land involved (hectare)	None
24.	Whether there is any litigation pending against the project and/or land in which the project is proposed to be set up Name of the court Case no Orders/ directions of the court, if any and its relevance with the proposed project.	None

2 Activity

1. Construction, operation or decommissioning of the Project involving actions, which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	No	Project was developed and in operation. The land for entire master plan (around 1200 acres) is reclaimed, levelled at the initial phase of development itself. Portion of the land is already developed as per development plan and Other areas are without any trees or vegetation. The change in land use pattern will be limited as per project development requirements (i.e. facilities yet to be developed) and shall be compatible with the facilities proposed in the master plan of the project for which CRZ/EC Validity extension was obtained.
1.2	Clearance of existing land, vegetation and buildings?	No	-
1.3	Creation of new land uses?	Yes	No major new land uses involved. Portion of the area was developed as a part of Initial Development. Remaining reclaimed area will be developed as per the Master Plan land use requirement within the project boundary as submitted thorough Appendix C during CRZ/EC Validity extension application and the same was recommended (refer Appendix B).
1.4	Pre-construction investigations e.g. bore houses, soil testing?	Yes	All the requisite Pre-construction investigations have been carried out as necessary for the area developed as per initial development plan. . All the requisite Pre-construction investigations if required will be carried out for the remaining area to be developed
1.5	Construction works?	Yes	The following are major facilities have been developed at the Shipyard cum <u>Port and Common Facilities:</u> <ul style="list-style-type: none"> • Two Breakwaters (North breakwater: 1775 m; South breakwater: 1665 m) • Navigational Channel

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			<ul style="list-style-type: none"> – Outer channel: Length:2325 m; Width:180 m; Depth(-)14 CD – Inner channel: Length:910 m; Width:215 m; Depth(-)14 CD • Other Navigation Facilities • Two berths <ul style="list-style-type: none"> – CB-1: Length: 353 m; Width: 35 m; Depth: (-) 14.0 m CD – CB – 2: Length: 360m; Width: 65 m; Depth: (-) 14.0 m CD • Container Freight Station • Control Tower • TNMB/Custom/LTSB Buildings • Admin and Immigration Buildings • Security and parking • Toilet Block/STP/Oil Water Separator • Canteen/Raw Water UG Sump/OHT/Pump House • Substations/Switchyard/DG Building/Workshops • Fire Station/Fire water UG Sump/Fire Water Pump House • Port Operational Buildings • Relocation of CPCL Intake/Outfall <p><u>Shipyard:</u></p> <ul style="list-style-type: none"> • Ship lift, Outfitting Jetties • Weigh Bridge • Plate Stockyard • Shops for Plate Preparation, Plate Forming, Panel Preparation, Unit/BLK Fabrication and Pipe • Scrap Yard • Assembly Shop for Ship and Submarine • Blasting /Painting Bay • Admin Block • Electrical Shop/Main Receiving Station/DG Room/Substations/ Staff and Workers Canteen • Covered and Open Area for Subcontractors • Security office • Fire Station/ Fire Fighting Water Reservoir • Special Storage Facility • QA Lab (Prod off In FF)

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			<ul style="list-style-type: none"> • Hull & Outfitting Shop – New Build • Common Machine Shop • Trolley Storage Bay • Engineering Shop – Repair • Hull & Outfitting Shop – Repair • Anchor Chain Cable Testing Bay • Shiplift Control Building • OH Tank & Sump and U/G Tank • STP/ETP • Hard Stand for Trunking Storage • Final Assembly Shop for Ship • Final Assembly Shop for Submarine • Parking Area – Main Gate • IOCL Petrol Pump <p><u>MFF:</u></p> <ul style="list-style-type: none"> • Work Zones • Spool Lay down Area • Equipment and Gas Cylinder Storage • P&M Stores and Maintenance • Crane Boom Storage • Open Plate Storage/Tubular and Beam Storage • Scaffolding Storage • Structural and Pipe Shops • Blasting shops for pipe spool and Painting Shops, • Fixture Storage/Warehouses • Overhead Tanks/Canteen • Weigh bridge and control room • Diesel dispenser unit • Security office, Watch Tower, Sub Station, Storm Water Drains, Toilet Block , ETP and STP etc., • Quay wall • Hazardous Waste Storage • Paint Storage <p>The facilities developed at Kattupalli Shipyard Cum Port are given as Appendix F.</p> <p>For complete operation of Kattupalli Port to handle 24.65 MTPA cargo, construction activities such as berths, storage area, extension of navigational facilities etc., are envisaged as a part of master plan development at Port side for</p>

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			<p>which Environmental/CRZ clearance and validity extension was obtained.</p> <p>For Shipyard Side, to achieve the complete target of 25 shipbuilding per annum and 60 ship repair per annum, and for MFF the necessary marine facilities, land side facilities will be developed as per the layout given in Appendix C.</p> <p>Some of the facilities yet to be developed are given below.</p> <p><u>Port and Common Facilities:</u></p> <ul style="list-style-type: none"> • Development of 3 Berths and 2 Port Craft Berths • Extension of Container Storage area • Development of Cargo Storage areas and Tank farms as per amended cargos. • Extension of Navigation facilities • Dredging of Port areas from (-)14.0 m to (-)16.7 m and Navigation Channel from (-)14.0 m to (-)17.5 m as per Master Plan • <u>Offshore Disposal of dredged material at the identified Dumping Site in a phased manner depends on the business requirement. (6.0 MCM)</u> • Augmentation of Necessary Cargo Handling equipments • Augmentation of STP/Oil Water Separators if required • Augmentation of Raw Water storage and supply Facilities • Green Belt Development <p><u>Shipyard:</u></p> <ul style="list-style-type: none"> • Similar to presently developed Facilities, there will be development of all shops/outfitting jetties/dry docks/stockyards etc., will be developed. • Dredging the Shipyard Area (from 10 m to 15 m) in a phased manner depends on the requirement.

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			<ul style="list-style-type: none"> • <u>Offshore Dumping of 5.0 MCM in a phased manner depends on the business requirement</u> • Green Belt Development <p>MFF:</p> <ul style="list-style-type: none"> • Admin/Client Office/Site Office • Canteen/Medical Centre • Fire water UG Sump/Raw Water PH • Parking areas • Substation • Toilet Block/ETP/STP • Contractor office/labour leisure office • Scarp Bin • Extension of Quay Wall • Berths/Outfitting Jetties • Dredging the MFF Area (from (-) 6 m to (-) 15 m in a phased manner. Immediate Dredging up to (-12) is envisaged. • <u>Offshore Dumping of 5.0 MCM dredged materials in a phased manner. Immediate dumping of 2.5 MCM is envisaged.</u> • Green Belt Development <p>The CRZ/EC validity extension was obtained for all the facilities yet to be developed as mentioned above and given as Appendix C.</p> <p>Present proposal is for Extension of Dredge Spoil Disposal Site only.</p>
1.6	Demolition works?	No	-
1.7	Temporary sites used for construction works or housing of construction workers?	Yes	<p>Adequate Temporary facilities (houses, water, power, fuel, sanitation etc.) for construction labour were implemented at project site during initial development</p> <p>As most of the facilities were developed, the construction work force requirement for the facilities to be developed will be minimal. Hence it is proposed to source the Workforce from nearby villages. However, temporary sites for housing of construction workers if required, housing with adequate facilities will be provided.</p>

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	Yes	<p>Implemented as per the project requirement in compliance with clearances obtained for the initial development.</p> <p>Envisaged as a part of the Master plan development and details are given in the respective layout. Appendix C.</p> <p>The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only.</p>
1.9	Underground works including mining or tunneling?	No	-
1.10	Reclamation works?	No	Entire project area is reclaimed and completely developed/levelled which will be used for the facilities yet to be developed. No reclamation is envisaged.
1.11	Dredging?	Yes	<p>As per EIA report (2008), Capital dredging is estimated about 24.0 MCM for the development of Master Plan. Out of which around 8 MCM was carried out during initial Phase of Development.</p> <p>Capital dredging is envisaged for the following activities:</p> <p><u>Port and Common Facilities:</u></p> <ul style="list-style-type: none"> • Near the Berths /Turning Circle and Approach Channel - 6.0 MCM <p><u>Shipyard:</u></p> <ul style="list-style-type: none"> • In and around Ship Lift Area – 5.0 MCM <p><u>MFF:</u></p> <ul style="list-style-type: none"> • MFF Quay area – 2.50 MCM (Immediate) • MFF Quay area – 2.50 MCM (Future) <p>Maintenance dredging of 0.4 MCM per Annum is also envisaged.</p> <p>The CRZ/EC validity extension was obtained for all the facilities yet to be developed including dredging as mentioned above and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only.</p>

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.12	Offshore structures?	Yes	<p>Major offshore structures such as Breakwaters, 2 Nos of Berths, Creation of Navigation facilities (14 m draft) at Port, Ship Lift, Outfitting jetties at Shipyard, quay wall at MFF etc., were carried out as part of initial development.</p> <p>Other remaining facilities such as construction of 03 berths, Port Craft berths at Port, Berths/Outfitting jetties, dry docks at Shipyard, extension of quay wall at MFF area etc., shall be carried out as per Master Plan requirement for which the Environmental/CRZ clearance was obtained.</p> <p>The CRZ/EC validity extension was also obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only.</p>
1.13	Production and manufacturing processes?	Yes	<p>No production or Manufacturing processes are envisaged at Port.</p> <p>However at Shipyard and MFF, Ship building/repairing and fabrication involves the processes such as in which cutting, welding, cleaning of ships, drilling, grinding, painting, dry abrasion blasting etc to produce various sections of ships and other fabrication units are being carried out. Environmental/CRZ clearance was obtained for shipyard cum port including MFF.</p>
1.14	Facilities for storage of goods or materials?	Yes	<p>The backup area for storage areas is developed and levelled, presently containers/general cargo are being stored at port and as per revised cargo mix(as per amendment) and master plan, storage areas will be provided within the developed backup area at port premises.</p> <p>In shipyard and MFF area the necessary storage area to store the raw materials such as plates, beams and pipes etc, is developed as per initial development requirement and will be extended as per Master Plan requirement.</p> <p>Layout showing the storage of goods and material is given as Appendix C.</p>

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			<p>The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only.</p>
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	<p>Sewage treatment plants of capacity 30 KLD, 10 KLD and 5 KLD capacities were developed in port. Oil water separator of 3 KLD capacities was developed.</p> <p>ETP of 105 KLD and STP of 150 KLD were developed in shipyard. An Additional facility of Oil – Water separator is proposed to attach with the existing Effluent Treatment Plant.</p> <p>ETP of 10 KLD and STP of 110 KLD are developed at MFF area. In addition a STP of 100 KLD is proposed to be developed.</p> <p>All the STP/ETP treated water is being used for Green Belt Development after meeting the prescribed standards and the same will be continued for proposed STP also.</p> <p>Sludge from STP is being used as manure for greenbelt and the same will be continued for proposed STP also.</p> <p>Activity for which Authorization Issued are [1] Used Oil, Oil containing Cargo residue / Washing water and sludge, Discarded Containers/barrels/liners contaminated with hazardous wastes/chemicals which shall be collected, stored, transport and disposed to Authorised / Registered recyclers. And [2] Wastes & Residues [Paint wastes], Sludge and filters contaminated with Oil & Chemical Sludge from ETP which shall be collected, stored, transport and disposal to TSDF, Gummidipoondi and Gujarat Enviro Protection and Infrastructure Limited, Ranipet, Vellore District.</p> <p>The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B.</p>

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			Present proposal is for Extension of Dredge Spoil Disposal Site only.
1.16	Facilities for long term housing of operational workers?	Yes	Housing facilities for operational staff are available in project site premises. Present Housing colony will be able to accommodate 88 employees and their families. Facilities will be extended as when required during master plan implementation.
1.17	New road, rail or sea traffic during construction or operation?	Yes	Movement of construction material, general traffic during construction of facilities to be developed Cargo movement is already being taken up by road/sea and general traffic by road. There will be increase in Traffic by road/sea according to cargo handling growth and other activities at Shipyard and MFF.
1.18	New road, rail, air waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc.?	No	Site is well connected to NH-5 at Panchetty and Jaganathapuram. The construction of Four (4) lane TPP road is 80% completed and will be commissioned soon. This will also improve the road connectivity to the Kattupalli Port Cargo is being handled in these routes.
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	-
1.20	New or diverted transmission lines or pipelines?	Yes	Required Infrastructure facilities such as power, water lines etc., were developed as a part of initial development. The same will be extended as per Master Plan requirement. The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B . Present proposal is for Extension of Dredge Spoil Disposal Site only.
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	Storm water drainage and rainwater harvesting structures were developed within project site. Same will be extended for the area to be developed.
1.22	Stream crossings?	No	-
1.23	Abstraction or transfers of water form ground or surface waters?	No	Existing source of water supply is Chennai Metro Water Supply and Sewerage Board (CMWSSB). Allotted water supply for the port cum shipyard is

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			around 1294 KLD. Presently 720 KLD of water is being supplied by CMWSSB.
1.24	Changes in water bodies or the land surface affecting drainage or run-off?	No	Storm water drainage and rainwater harvesting structures were implemented in compliance with statutory clearances.
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	Movement of construction material, general traffic during construction of master plan facilities. Cargo movement is already being taken up by road/sea and general traffic by road.
1.26	Long-term dismantling or decommissioning or restoration works?	No	-
1.27	Ongoing activity during decommissioning which could have an impact on the environment?	No	-
1.28	Influx of people to an area in either temporarily or permanently?	Yes	Temporary and limited during construction activities of master plan facilities and marginal and permanent during operation phase
1.29	Introduction of alien species?	No	-
1.30	Loss of native species or genetic diversity?	No	-
1.31	Any other actions?	No	-

2. Use of Natural resources for construction or operation of the Project (such as land, water, materials or energy, especially any resources that are non-renewable or in short supply):

S. No.	Information/checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	No	Project was developed and in operation. The land for entire master plan (around 1200 acres) is reclaimed, levelled land without any trees or vegetation. The change in land use pattern will be limited as per project development requirements and shall be compatible with the master plan of the project for which Environmental/CRZ Clearance was obtained. The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B . Present proposal is for Extension of Dredge Spoil Disposal Site only.
2.2	Water (expected source & competing users) unit: KLD	Yes	Existing source of water supply is Chennai Metro Water Supply and Sewerage Board (CMWSSB). Allotted water supply for the port cum shipyard is around 1294 KLD. Presently 720 KLD of water (60KLD for Port + 150 KLD for MFF + 510 KLD for Shipyard) is being supplied by CMWSSB.
2.3	Minerals (MT)	No	-
2.4	Construction material – stone, aggregates, sand / soil (expected source – MT)	Yes	Soil, sand, gravel, stone aggregates will be procured from nearby sources. The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B . Present proposal is for Extension of Dredge Spoil Disposal Site only.
2.5	Forests and timber (source – MT)	No	-

S. No.	Information/checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)	Yes	<p>Port:</p> <ul style="list-style-type: none"> The power demand at the Port is 6.5 MVA. The power demand for the final phase is estimated at 23.1 MVA. Power facilities provided at the port include the provision for the final phase also. The source of power to the port cum shipyard complex is 110 KV TNEB substation located at Attipattu. In port power supply of 110 KV is stepped down to 11 KV through the available substations. The power from the substation is received at the receiving yard located at the North West corner of port. To distribute the power efficiently at the port four substations (11KV distribution voltage system) other than main, one at Quay, second at work shop and third at CFS. <p>Shipyard:</p> <ul style="list-style-type: none"> Power requirement for shipyard operations is around 670,000 KWH per Annum. Power facilities provided at the Shipyard include the provision for the final phase also. <p>MFF:</p> <ul style="list-style-type: none"> Power requirement for MFF operations is around 3.0 MVA. The power demand for the final phase is estimated at 5.0 MVA. Two (02) Substations with 2500 KVA capacity each are provided. Apart from the above, DG of 925 KVA is provided and another 925 KVA will be provided.
2.7	Any other natural resources (use appropriate standard units)	No	-

3. Use, storage, transport, handling or production of substances or materials, which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health.

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	Yes	<p>Port: The cargo is being handled/ to be handled are Ro-Ro, and Liquid Non-hazardous cargo, Containers, General Cargo and Break bulk etc., The Containerised hazardous cargo is being /will be handled as per International Maritime Dangerous Goods Code (IMDG).</p> <p>Shipyard: At shipyard, solvents, anti fouling paint, gases etc will be used for different activities based on the requirements in compliance to clearances obtained.</p> <p>MFF: Paints, Thinners, Compressed gases and Diesel etc use shall be envisaged at MFF according to project specific requirements.</p>
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	-
3.3	Affect the welfare of people e.g. by changing living conditions?	Yes	<p>Direct and Indirect employment during construction and operation phases of the project.</p> <p>Present Employment at Kattupalli Shipyard Cum Port is about 5062 Nos. (250 no. in Port + 3112 no. in Shipyard + 1700 no. in MFF).</p> <p>During Operation Stage of all the facilities as per Master Plan, the employment potential is estimated as 9000 Nos (300 no. in Port + 4200 no. in Shipyard + 4500 no. in MFF).</p>

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,	No	-
3.5	Any other causes	No	-

4. Production of solid wastes during construction or operation or decommissioning (MT/month)²

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes	Yes	<p>Dredge Spoil is envisaged for the following dredging activities:</p> <p><u>Port and Common Facilities:</u></p> <ul style="list-style-type: none"> Near the Berths/Turning Circle and Approach Channel - 6.0 MCM <p><u>Shipyard:</u></p> <ul style="list-style-type: none"> In and Around Ship Lift/Outfitting Jetties Area – 5.0 MCM <p><u>MFF:</u></p> <ul style="list-style-type: none"> MFF Quay area – 2.50 MCM (Immediate) MFF Quay/berth area – 2.50 MCM (Future) <p>Maintenance dredging of 0.4 MCM per Annum is also envisaged.</p> <p>The CRZ/EC validity extension was obtained for all the facilities yet to be developed including dredging as mentioned above and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only.</p> <p>During CRZ/EC Extension validity application it was proposed to use the existing disposal site and also mentioned that Bathymetry Changes of the disposal area is being carried</p>

² The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only.

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			<p>out.</p> <p>Based on the pre and post dumping bathymetry analysis of dumping site, it was observed that the average thickness of deposition in the disposal ground is found to be in the range of 0.9m to 1.5m and existing disposal site (1.0x1.5 km) is designed to accommodate only initial phase dredged materials.</p> <p>Hence, it is suggested to extend dumping site in deeper water in order to maintain the natural depth with minimal variations. Accordingly LTSB carried out the studies to identify the disposal location to accommodate present dumping requirements along with dredge spoil disposal mathematical modelling. The dredge spoil disposal study at the proposed extended disposal site is given as Standalone Document.</p>
4.2	Municipal waste (domestic and or commercial wastes)	Yes	<p>Presently, sludge from the STP is being used as manure for greenbelt. Municipal solid waste generated at Shipyard cum port complex of about 0.5 TPD is being disposed to the Landfill site located at LTSB premises For the Proposed Master plan activities, MSW is estimated at 0.75 TPD, which shall also be disposed in the same area.</p> <p>It is being installed an Organic Waste Converter (OWC) of 100 kg/day at shipyard premises which will convert the organic waste in to odourless pre compost manure within 15-20 minutes.</p>
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	Yes	<p>Port: Most of the cargo is being handled and proposed to be handled at Kattupalli Port are non- hazardous in nature except the containerised hazardous cargo which will be handled as per IMDG code. Hazardous waste during spill if any and used oil & Used Battery etc</p>

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			<p>TSDf located at Gummidipoondi, along with other shipyard wastes.</p> <p>Shipyard:</p> <p>Hazardous wastes such as used/spent oil (80000 LPY), Wastes/Residues containing Oil (100 TPA), oil containing cargo residue, wash water and sludge (2000 TPA), Sludge and filter contaminated with Oil (3 TPA), Containers/Barrels/liners Contaminated with HW/Chemicals (15,000 Nos), waste and residue 50 TPA and Sludge from ETP (10 TPA), generated in shipyard is being sent to TSDf located at Gummidipoondi, along with other shipyard wastes.</p> <p>Hazardous wastes are being stored above the impervious platform and closed shed proposed to be developed.</p> <p>The consent for the same was already obtained and the same can be extended for master plan requirements.</p> <p>MFF:</p> <p>Hazardous wastes such as Sludge and filter contaminated Oil (0.12 TPA), Used Oil (2500LPA), Wastes/Residues containing Oil (2.5 TPA), Waste and Residue (5 TPA), Discarded Containers/Barrels/liners contaminated with HW/Chemicals (4000 Nos) and Sludge from ETP (10 TPA) is being generated in MFF will be handled by TNPCB Approved vendor (Gujarat Enviro Protection & Infrastructure Limited, Ranipet, Vellore) The consent for the same was already obtained and the same will be extended for master plan requirements.</p>
4.4	Other industrial process wastes	Yes	<p>During Shipbuilding/Repairing process, the following wastes are envisaged.</p> <ul style="list-style-type: none"> • Ferrous Scrap - 900 Tons Per Annum • Non Ferrous Scrap - 70 Tons per

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			Annum
4.5	Surplus product	No	-
4.6	Sewage sludge or other sludge from effluent treatment	Yes	Presently, sludge from the STP is being used as manure for greenbelt. Sludge from proposed STP also will be used as manure. ETP/oil Water sludge will be sent to TSDf along with other shipyard/MFF hazardous waste through authorized waste handlers.
4.7	Construction or demolition wastes	Yes	Construction waste will be disposed to the approved recycler in the region.
4.8	Redundant machinery or equipment	No	-
4.9	Contaminated soils or other materials	No	Soil contamination is not envisaged during normal operation of shipyard cum port and accidental spills if any, shall be mitigated through suitable preventive and control measures during normal operation in compliance to Environmental/CRZ Clearances obtained.
4.10	Agricultural wastes	No	-
4.11	Other solid wastes	No	-

5. Release of pollutants or any hazardous, toxic or noxious substances to air³

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources	Yes	<ul style="list-style-type: none"> • Emissions from DG Sets during Power failure. • Emission from DG mounted RTGC at port. • Exhaust emissions from diesel run equipments, engines, transport vehicles and machinery during construction and operational phases of master plan facilities. • Emission from Dredgers/work boats etc., Suitable mitigation measures such as water sprinkling, PUC certified vehicles, well maintained construction equipments low Sulphur Diesel Fuel, suitable stack height for DG sets etc., are being maintained.
5.2	Emissions from production processes	Yes	From welding, cutting, painting shops & coating, grinding, cleaning, blasting shops etc., at Shipyard and MFF are envisaged from the developed facilities and facility to be developed.. Suitable stack height for Painting and Blasting shops, Pulse jet bag filter for blasting shops etc., are being maintained and shall be extended for future operations.

³ The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
5.3	Emissions from materials handling including storage or transport	Yes	<p>Presently containers and general cargo are being handled at port where there are only vehicular emissions due to transport and handling equipments such as RTGCS. Handling of Break Bulk Cargo/General Cargo/Project Cargo may increase fugitive emission during handling, internal transportation and storage. Suitable control measures including proposed greenbelt development, water sprinkling, and covering such cargo with Tarpaulin sheets to minimise the impacts will be carried out.</p> <p>At MFF and Shipyard during material handling, there will be emissions from DG operated cranes etc.,</p>
5.4	Emissions from construction activities including plant and equipment	Yes	<ul style="list-style-type: none"> • Emission from diesel operated pumps, concrete mixers, equipment vibrators and excavators during construction activities of master plan facilities. • These equipments will be maintained properly to ensure minimum emissions, more-over construction activity will be for a short duration of period and restricted within the Project boundary.
5.5	Dust or odours from handling of materials including construction materials, sewage and waste	Yes	<ul style="list-style-type: none"> • Dust due to handling of material during construction and cargo handling • Dust suppression measures like water sprinkling and greenbelt are being implemented at site which will be extended to master plan development • Sewage is being conveyed in closed conduits and treated in STP. Green Belt around the STP is being grown.
5.6	Emissions from incineration of waste	No	-
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	-

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
5.8	Emissions from any other sources	No	-

6. Generation of Noise and Vibration, and Emissions of Light and Heat⁴

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	Yes	<p>Noise</p> <ul style="list-style-type: none"> • During Construction of master plan activities 70-85 dB(A) will be expected near to the noise generating source such as DG sets, heavy equipments dredgers etc. and PPEs will be provided to the workers. • During the operational phase, noise will be generated due to the cargo handling and storage operations by using equipments such as unloaders, mobile harbour crane, trucks etc at port premises. • During Operation of Shipyard and MFF, noise will be generated due to ship building and repairing activities and fabrication of sections. • Equipment will be deployed with noise mitigating devices conforming to applicable standards
6.2	From industrial or similar processes	Yes	Necessary acoustic enclosures have been provided at shipyard and MFF for manufacturing equipments. Also the same will be ensured for the master plan activities.
6.3	From construction or demolition	Yes	<ul style="list-style-type: none"> • Excavators • Dumpers • Welding/Drilling • Trucks etc. • Dredgers and Work boats Personnel Protection Equipment (PPE) will be provided to workers during construction activities of

⁴ The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
			Master Plan.
6.4	From blasting or piling	Yes	Noise is envisaged during Blasting operations at MFF and Shipyard. Also during construction of master plan facilities noise can be envisaged from piling activities. Suitable Noise Enclosures will be provided. Piling shall be carried out with necessary precautionary measures.
6.5	From construction or operational traffic	Yes	From construction material movement, other vehicular and inland cargo movements etc.,. Necessary mitigation measures will be followed
6.6	From lighting or cooling systems	Yes	During the welding and cutting, electrical lighting, power circuits, drilling etc. lighting may be produced where workers are provided necessary PPE. From Air conditioning and ventilation system generates noise and necessary enclosure shall be provided.
6.7	From any other sources	No	-

7. Risks of contamination of land or water from releases of pollutants into the ground or into sewers, surface waters, groundwater, coastal waters or the sea⁵

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	Yes	The cargo is being handled/ to be handled are Ro-Ro, and Liquid Non-hazardous cargo, Containers, General Cargo and Break bulk etc., The Containerised hazardous cargo is being /will be handled as per International Maritime Dangerous Goods Code (IMDG). In shipyard and MFF, Hazardous materials such as paints, solvents, welding gases etc., are being stored and handled as per the provisions of

⁵ The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
			<p>the manufacturer, storage and import of Hazardous Chemical Rules, Hazardous Wastes (Management and Handling) Rules and Amendments thereof.</p> <p>No spill of these materials at Port and shipyard is expected under normal operations. However, during accidental spills if any shall be recovered by adopting appropriate measures.</p> <p>Hazardous wastes generated in shipyard and port will be sent to TSDF located at Gummidipoondi, along with other shipyard wastes. The consent for the same was already obtained and the same can be extended.</p>
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	<p>Sewage treatment plants of capacity 30 KLD, 10 KLD and 5 KLD capacities were developed in port. Oil water separator of 3 KLD capacity was developed.</p> <p>ETP of 105 KLD and STP of 150 KLD were developed in shipyard. In addition a STP of 110 KLD and ETP of 10 KLD are developed at MFF area. In addition ETP of 100 KLD is yet to be developed at MFF area.</p> <p>The treated sewage is being used for greenbelt application. The treated water from ETP is being also used for green belt.</p> <p>An agreement with TSDF at Gummidipundi and Gujarat Enviro Protection and Infrastructure Limited, Ranipet, Vellore District was signed for handling hazardous waste.</p> <p>The treatment facilities developed will be extended for Master plan development suitably.</p>

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities/rates, wherever possible) with source of information data
7.3	By deposition of pollutants emitted to air, onto the land or into water	Yes	<ul style="list-style-type: none"> • Emissions due to operation of DG sets during power failure • Emissions from DG mounted RTGCs • From welding, cutting, painting shops & coating, grinding, cleaning, blasting shops etc., at Shipyard and MFF are envisaged from the developed facilities and facility to be developed.. <p>Suitable stack height for Painting and Blasting shops, Pulse jet bag filter for blasting shops etc., are being maintained and shall be extended for future operations</p> <p>Dust suppression measures like water sprinkling and greenbelt are being implemented at site which will be extended to master plan development.</p> <p>Sewage and effluent generated in the Shipyard cum port complex will be treated in STP and ETP. Treated wastewater will be used for Green Belt development after meeting the prescribed standards for land application.</p> <p>An oil spill contingency plan is prepared and approved by coast guard.</p>
7.4	From any other sources	No	-
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	-

8. Risk of accidents during construction or operation of the Project, which could affect human health or the environment⁶

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires, etc. from storage, handling, use or production of hazardous substances	Yes	<ul style="list-style-type: none"> During construction there will be requirement to store hazardous material such as welding gases, paints, lubricants etc. <p>During operations, no Hazardous cargo Handling /storage is envisaged in the port except the hazardous containerised cargo (handled as per IMDG code). In shipyard and MFF, Hazardous materials are being stored and handled as per the provisions of the manufacturer, storage and import of Hazardous Chemical Rules, Hazardous Wastes (Management and Handling) Rules and Amendments thereof.</p> <p>Hazardous wastes generated in shipyard and port will be sent to TSDf located at Gummidipoondi, along with other shipyard wastes. The consent for the same was already obtained and the same can be extended.</p>
8.2	From any other causes	No	-
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?	Yes	Cyclone prone and Tsunami effected area. Structural design has factored these aspects and in future also will be adopted.

⁶ The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only

9. Factors which should be considered (such as consequential development) which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality⁷

S. No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
9.1	Lead to development of supporting utilities, ancillary development or development stimulated by the project which could have impact on the environment e.g. 1. Supporting infrastructure (roads, power supply, waste or wastewater treatment, etc.) 2. Housing development 3. Extractive industries 4. Supply industries 5. Other	Yes	<ul style="list-style-type: none"> Induced development due to the project in the region, which will create better infrastructure and will attract migration of people Necessary supportive utilities, infrastructure, housing etc to cater the requirements of the project would be developed as a part of the project.
9.2	Lead to after-use of the site, which could have an impact on the environment	No	-
9.3	Set a precedent for later developments	Yes	The project would increase the commercial/industrial activities in the region.
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	Cumulative impacts were studied during Shipyard Cum Port development stage and EC/CRZ Clearances were obtained.

⁷ The CRZ/EC validity extension was obtained for all the facilities yet to be developed and given as Appendix B. Present proposal is for Extension of Dredge Spoil Disposal Site only

3 Environmental Sensitivity

S. No.	Areas	Name/Identity	Aerial distance (within 15 km) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value	Pulicat Lake	12 Km, N
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	-	-
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration	Pulicat Lake	12 Km, N
4	Inland, coastal, marine or underground waters	Buckingham Canal	>0.05 Km, W
		Pulicat Lake	12 Km, N
		Bay of Bengal	Adjacent, E
5	State, National boundaries	-	-
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	-	-
7	Defence installations	-	-
8	Densely populated or built-up area	Vallur Camp	8.0 Km, SW
		Minjur Town	8.0 Km, WSW
		New Manali Town	12.0 Km, SSW
		Ponneri Town	15.0 Km, WNW
9	Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)	-	-

S. No.	Areas	Name/Identity	Aerial distance (within 15 km) Proposed project location boundary
10	Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)	-	-
11	Areas already subjected to pollution or environmental damage. (those where existing legal environmental standards are exceeded)	-	-
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)	The project site falls under seismic Zone III (moderate earthquake zone) as per IS 1893 (Part I) 2002 of Indian Seismic map. This project site is not influenced by high frequency cyclonic disturbances. Structural design has factored these aspects.	

"I hereby undertake that the data and information given in the application and enclosures are true to the best of my knowledge and belief and I am aware that if any part of the data and information submitted is found to be false or misleading at any stage, the project will be rejected and clearances given, if any to the project will be revoked at our risk and cost."

Date: 25.03.2015

Place: Chennai


Col(Retd) Gopinath Menon
 Head Central Services
 L&T Shipbuilding Limited
 Kattupalli Village, Ponneri Taluk,
 Tiruvallur District, Pin Code: 600 120
 Tamil Nadu, India

Appendices

Appendix – A

*Environmental/CRZ Clearance Letter and its
Latest Compliance Report*

No. 10-130/2007-IA.III
Government of India
Ministry of Environment & Forests
(IA-III Division)

Paryavaran Bhawan,
C.G.O. Complex, Lodhi Road,
New Delhi - 110 003.

Dated : 3rd July, 2009.

To
M/s. L & T Ship Building Limited,
(Joint venture of L&T and TIDCO)
L & T Chennai House,
10, Club House Road,
Anna Salai, Chennai - 600 002.

Subject: CRZ and Environmental Clearance for the development of proposed Shipyard - cum - Minor Port Complex at Kattupalli, Ponneri Taluka, Tiruvallur District, Tamil Nadu by M/s. L & T Ship Building Limited (Joint venture of L&T and TIDCO) - Reg.

This has reference to your letter no. D/Shipyard/00/07 dated 29.10.2007, 06.06.2008, 20.03.2009 and 30.04.2009 from Director, Tamil Nadu Industrial Development Corporation Ltd. and letter. No. L&T /Shipyard/08/10 dated 13.06.2008, No. LTSB-08/MoEF/029 dated 28.08.2008 from Director, L&T Shipyard Ltd., No. LTSB-08/MoEF/033 dated 23.09.2008, on the subject mentioned above, seeking prior Clearance under EIA Notification, 2006 and Coastal Regulation Zone Clearance for the above project. The proposal has been appraised as per prescribed procedure in the light of provisions under the EIA Notification, 2006 and CRZ Notification, 1991 on the basis of the mandatory documents enclosed with the application viz., the Questionnaire, EIA, EMP and the additional clarifications furnished in response to the observations of the Expert Appraisal Committee constituted by the competent authority in its meetings held on 22nd - 23rd October, 2008.

2. It is interalia, noted that the project involves the development of shipyard - cum - minor port on an area of 1152 acres. It is proposed to construct two breakwaters to provide the requisite tranquillity in the harbour basin. The northern breakwater is about 1.5 km long and the southern breakwater is about 3 km long. It is proposed to provide a navigation channel of 300 m width, dredged to a depth of 15m CD. The length of the navigation channel is about 5 km. The facility proposed are Dry dock, Ship-lift, Outfitting jetties, Annual steel processing capacity of



about 450,000 T and Ship-building facilities for about 25 ships per year with product mix of high-end vessels like Crude Oil Tanker VLCC (300,000 DWT), Crude Oil Tanker Handysize (46,100 DWT), Bulker Panmax (80,000 DWT), Chemical Tanker (33,300 DWT), Container Ship (2,600 TEUs /35,000 DWT). Ship repair facilities for 60 ships per year up to VLCC size including offshore platforms/jack-up rigs. It is also proposed to build a minor port of 1400 m long berth phase for handling containers and break bulk cargo and 300 m long berth for handling shipyard cargo. The total cost of the project is Rs.3070 crores.

3. This activity comes under Category 7 (c) "Ports, Harbours" of EIA Notification, 2006. Out of total area of 1152 acres, 292.68 acres fall under CRZ-I and CRZ-III of the CRZ Notification 1991, the proposed facility is permissible in CRZ area. Tamil Nadu State Coastal Zone Management Authority in its meeting held on 17.10.2008 has recommended the proposal with certain conditions vide letter No. R.C. No.P1/2004/2008 dated 21.10.2008, which project proponent has to comply strictly. The recommendations were forwarded to the Ministry vide letter No.23037/EC3/08-1, dated 05.11.2008.

4. The Expert Appraisal Committee, after due consideration of the relevant documents submitted by the project proponent and additional clarifications furnished in response to its observations, have recommended for grant of clearance under EIA Notification, 2006 and CRZ Notification, 1991. Accordingly, the Ministry hereby accord necessary Clearance as per the provisions of EIA Notification, 2006 and CRZ Notification, 1991 and its subsequent amendments, subject to strict compliance of the terms and conditions as follows:

5. Specific Conditions:

- (i) The proponent shall comply all the conditions stipulated in the letter R.C.No.P1/2004/2008, dated 21.10.2008 of Department of Environment, Chennai.
- (ii) The proponent shall comply all the commitment made vide his letter No. D/Shipyard/00/07 dated 20.03.2009.
- (iii) Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.
- (iv) There shall be no withdrawal of groundwater in Coastal Regulation Zone area, for this project. In case any ground water is proposed to be withdrawn from outside the CRZ area, specific prior permission from the concerned State / Central Groundwater Board shall be obtained in this regard.



- (v) The paints based on 'primer non-toxic water organic co-polymer latex solvent free' shall be used to prevent VOC. No Tri butyl Tin (TBT) based paints shall be used.
- (vi) No dumping of dredging materials in the sea shall be undertaken. In case of sea dumping is required, an integrated modelling study to be carried out to locate the dump site so that it does not cause any problem to Ennore port.
- (vii) Shoreline changes due the project shall be monitored continuously. Nourishment of northern shoreline shall be carried out using the sediments from beach acceleration on the southern shoreline.
- (viii) Suitable screens shall be installed between the construction area and the intakes so that operation of the intakes are not affected by the construction activity.
- (ix) At least a distance of 100 meters shall be provided between intake of Chennai Water Desalination Ltd. (CWDL) and north edge of the northern breakwater as agreed in the meeting between the proponent and CWDL.
- (x) An independent port connectivity shall be developed.
- (xi) Rehabilitation if any shall be carried out as per law/ State Government.
- (xii) Fire station shall be located within the project area
- (xiii) The Hazardous waste generated shall be properly collected and handled as per the provisions of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.
- (xiv) The waste water generated from the activity shall be collected, treated and reused properly.
- (xv) Sewage Treatment facility should be provided in accordance with the CRZ Notification.
- (xvi) No solid waste will be disposed of in the Coastal Regulation Zone area. The solid waste shall be properly collected, segregated and disposed as per the provision of Solid Waste (Management and Handling) Rules, 2000.
- (xvii) Installation and operation of DG set if any shall comply with the guidelines of CPCB.



- (xviii) There shall be no reclamation / dredging of areas.
- (xix) Air quality including the VOC shall be monitored regularly as per the guidelines of CPCB and reported.
- (xx) The project proponent shall undertake green belt development all along the periphery of the project area and also along side the road.
- (xxi) All necessary clearances from the concerned agencies shall be obtained before initiating the project.
- (xxii) Project proponent shall install necessary oil spill mitigation measures in the shipyard. The details of the facilities provided shall be informed to this Ministry within 3 months from the date of receipt of this letter.
- (xxiii) No hazardous chemicals shall be stored in the Coastal Regulation Zone area.
- (xxiv) The project shall not be commissioned till the requisite water supply and electricity to the project are provided by the PWD/ Electricity Department.
- (xxv) Specific arrangements for rainwater harvesting shall be made in the project design and the rain water so harvested shall be optimally utilised.
- (xxvi) The facilities to be constructed in the CRZ area as part of this project shall be strictly in conformity with the provisions of the CRZ Notification, 1991 and its amendment. The facilities such as office building and residential buildings which do not require water front and foreshore facilities shall not be constructed within the Coastal Regulation Zone area.

6. General Conditions:

- (i) Construction of the proposed structures shall be undertaken meticulously conforming to the existing Central/local rules and regulations including Coastal Regulation Zone Notification 1991 & its amendments. All the construction designs / drawings relating to the proposed construction activities must have approvals of the concerned State Government Departments / Agencies.
- (ii) Adequate provisions for infrastructure facilities such as water supply, fuel, sanitation etc. shall be ensured for construction workers during the construction phase of the project so as to avoid felling of trees/mangroves and pollution of water and the surroundings.



- (iii) The project authorities shall make necessary arrangements for disposal of solid wastes and for the treatment of effluents by providing a proper wastewater treatment plant outside the CRZ area. The quality of treated effluents, solid wastes and noise level etc. must conform to the standards laid down by the competent authorities including the Central/State Pollution Control Board and the Union Ministry of Environment and Forests under the Environment (Protection) Act, 1986, whichever are more stringent.
- (iv) The proponent shall obtain the requisite consents for discharge of effluents and emissions under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981 from the Tamil Nadu State Pollution Control Board before commissioning of the project and a copy of each of these shall be sent to this Ministry.
- (v) In order to carry out the environmental monitoring during the operational phase of the project, the project authorities shall establish an environmental laboratory well equipped with standard equipment and facilities and qualified manpower to carry out the testing of various environmental parameters.
- (vi) The proponents shall provide for a regular monitoring mechanism so as to ensure that the treated effluents conform to the prescribed standards. The records of analysis reports must be properly maintained and made available for inspection to the concerned State/Central officials during their visits.
- (vii) The sand dunes and mangroves, if any, on the site shall not be disturbed in any way.
- (viii) A copy of the clearance letter will be marked to the concerned Panchayat / local NGO, if any, from whom any suggestion / representation has been received while processing the proposal.
- (ix) The Tamil Nadu Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's Office/Tehsildar's Office for 30 days.
- (x) The funds earmarked for environment protection measures shall be maintained, in a separate account and there shall be no diversion of these funds for any other purpose. A year-wise expenditure on environmental safeguards shall be reported to this Ministry.



- (xi) Full support shall be extended to the officers of this Ministry's Regional Office at Bangalore and the officers of the Central and State Pollution Control Boards by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities.
- (xii) In case of deviation or alteration in the project including the implementing agency, a fresh reference shall be made to this Ministry for modification in the clearance conditions or imposition of new ones for ensuring environmental protection.
- (xiii) This Ministry reserve the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.
- (xiv) This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with.
- (xv) The Project proponents shall inform the Regional Office at Bangalore as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of Land Development Work.

Direct a reply
B-10 ✓

7. These stipulations would be enforced among others under the provisions of water (Prevention and Control of Pollution) Act, 1974 the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991, the Hazardous Chemicals (Manufacture, Storage and Import) Rules, 1989, Municipal Solid Wastes (Management and Handling) Rules, 2000 and the Coastal Regulation Zone Notification, 1991 and its subsequent amendments made thereunder from time to time.

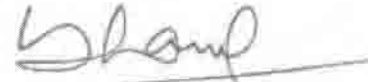
8. All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.

9. The project proponent should advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Tamil Nadu Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forests at <http://www.envfor.nic.in>. The advertisement should be made within 10

✓ days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bangalore.

10. Any appeal against this Environmental Clearance shall lie with the National Environment Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.

11. Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent in its website.



(Bharat Bhushan)
Director (IA-III)

03.07.2009

Copy to:

1. The Secretary, Department of Environment, Govt. of Tamil Nadu, Chief Secretariate, Chennai.
2. The Chairman, CPCB, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi - 32.
3. The Chairman, Tamil Nadu Coastal Zone Management Authority, Guindy Anna Salai, Chennai.
4. The C.C.F., Regional Office (SZ), Ministry of Environment & Forests, Kendriya Sadan, IV Floor, Environment & Forests Wings, Office (SZ), 7th Main Road, II Block, Koramangala, Bangalore - 560 034.
5. Guard File.
6. Monitoring Cell.

(Bharat Bhushan)
Director (IA-III)

LTSB/SYCMP/MoEF/SZ-BLR- 02/2014.

6th October 2014.

Director [S],
Government of India,
Ministry of Environment and Forest,
Regional Office [South Zone],
Kendriya Sadan, 4th Floor, E & F Wings,
Koramangala,
Bangalore – 560 034.

Dear Sir,

Sub: Half Yearly Compliance Report to Specific & General Condition of MoEF.

We are herewith enclosing the status of the Specific & General Conditions of Compliance along with the analytical reports of Treated Sewage Water, Ambient Air Quality Survey and Stack survey for the period from April 2014 to September 2014.

Submitted for your perusal and records.

Thanking You,

For L & T Shipbuilding Limited

Authorized Signatory

Enclosures:



- 1] Annexure – 01 STP Treated Water Analytical Report.
- 2] Annexure – 02 DG Set Stack Emission Report.
- 3] Annexure – 03 Ambient Air Quality Report.
- 4] Annexure – 04 V.O.C Measurements Report.
- 5] Annexure – 05 Process Stack Emission Report.
- 6] Annexure – 06 Ambient Noise Level Report.

Copy To:

- [1] The Secretary, Ministry of Environment and Forest, Paryavaran Bhavan, CGO Complex, Lodhi Road, New Delhi – 110003.
- [2] The District Environmental Engineer, Tamilnadu Pollution Control Board, 77 – A, South Avenue Road, Ambattur Industrial Estate, Ambattur Taluk, Chennai – 600 058.

**SHIP YARD CUM MINOR PORT PROJECT AT KATTUPALLI, TAMILNADU
ENVIRONMENTAL CLEARANCE FROM MoEF**

Letter No: 10 – 130 / 2007 – 1A. III, Dated: July 3, 2009

S.No	MoEF Specific Conditions	Status of Compliance
SPECIFIC CONDITIONS		
1.	The proponent shall comply all the conditions stipulated in the letter R.C. No.P1/2004/2008, dated 21.10.2008 of Department of Environment, Chennai.	Complied.
2.	The proponent shall comply all the commitment made vide his letter No. D/Shipyard/00/07 dated 20.03.2009.	Complied.
3.	Provision shall be made for the housing of construction labour within the site will all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile ST, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	Complied. The temporary structures were removed from the project site.
4.	There shall be no withdrawal of groundwater in Coastal Regulation Zone area, for this project. In case any ground water is proposed to be withdrawn from outside the CRZ area, specific prior permission from the concerned State Central Groundwater Board shall be obtained in this regard.	The unit is procuring water from M/s. Chennai Metropolitan Water Supply and Sewerage Board, Chennai.
5.	The paints based on "Primer non-toxic water organic co-polymer latish solvent free" shall be used to prevent VOC. No. Tri butyl Tin [TBT] based paints shall be used.	The unit is not using any paints based on Tri butyl [TBT].
6.	No dumping of dredging materials in the sea shall be undertaken. In case of sea dumping is required an integrated modelling study to be carried out to locate the dump site so that it does not cause any problem to Ennore Port.	Agreed.
7.	Shoreline changes due to project shall be monitored continuously. Nourishment of northern shoreline shall be carried out using the sediments from beach acceleration on the southern shoreline.	Being monitored regularly.



8.	Suitable screens shall be installed between the construction area and the intakes so that operation of the intakes is not affected by the construction activity.	Complied.
9.	At least a distance of 100 meters shall be provided between intake of Chennai Water Desalination Ltd., [CWDL] and north edge of the northern breakwater as agreed in the meeting between the proponent and CWDL.	Complied.
10.	An independent port connectivity shall be developed.	Complied.
11.	Rehabilitation if any shall be carried out as per law / State Government.	Complied.
12.	Fire station shall be located within the project area.	Unit is having a Fire Station with Fire Tender which is located inside the project site.
13.	The Hazardous Waste generated shall be properly collected and handled as per the provisions of Hazardous waste [Management, Handling and Transboundary Movement] Rules, 2008.	The unit has valid authorization vide authorization number – 4380 dated 06/12/2013 Proceedings No: T7/TNPCB/F.15586/HWM/AMB/2013 dated 6/12/2013. The unit ensures to handle the generated hazardous waste as per the rules.
14.	The waste water generated from the activity shall be collected, treated and reused properly.	The unit had commissioned Sewage / Effluent Treatment Plant to treat the waste water generated during the activities.
15.	Sewage Treatment facility should be provided in accordance with the CRZ Notification.	The unit had provided Sewage Treatment Plant and the plant is operated efficiently and effectively to meet the standards prescribed by the Board. Refer Annexure – 01.
16.	No solid waste will be disposed of in the Coastal Regulation Zone area. The solid waste shall be properly collected, segregated and disposed as per the provision of Solid Waste [Management and Handling] Rules, 2000.	We introduced Organic Waste Converter to convert the food waste to manure.
17.	Installation and operation of DG set if any shall comply with guidelines of CPCB.	As stipulated the unit had installed DG sets and being operated efficiently as per the guidelines CPCB. Refer Annexure – 02.
18.	There shall be no reclamation / dredging of areas.	LTSB requested amendment towards this condition "Project area would be reclaimed by using the dredged material. MoEF issued amendment

The image shows a handwritten signature in black ink over a circular blue stamp. The stamp contains the text 'SILVERLINE BUILDING LIMITED' around its perimeter. The signature is written in a cursive style across the bottom right of the page.

		letter No: 10/130/2007/A-III, Dated 12 th May 2010.
19.	Air quality including the VOC shall be monitored regularly as per the guidelines of CPCB and reported.	The unit is monitoring the Ambient Air Quality and Stack Monitoring on a monthly basis and the monthly report of analysis are being submitted to the Board. Refer Annexure – 03, 04 and 05 [Apr 14 to Oct 14] for your perusal.
20.	The project proponent shall undertaken green belt development all along the periphery of the project area and also alongside the road.	Process is on-going in line with the requirement.
21.	All necessary clearances from the concerned agencies shall be obtained before initiating the project.	Complied.
22.	Project proponent shall install necessary oil spill mitigation measures in the shipyard. The details of the facilities provided shall be informed to this Ministry within 3 months from the date of receipt of the letter.	Complied.
23.	No hazardous chemical shall be stored in the Coastal Regulation Zone area.	Complied.
24.	The project shall not be commissioned till the requisite water supply and electricity to the project are provided by the PWD / Electricity Department.	The water requirement is met through Chennai Metro Water Supply and Sewerage Board [CMWSSB]. The Power required for the development is met through Tamil Nadu Electricity Board [TNEB].
25.	Specific arrangements for rainwater harvesting shall be made in the project design and the rain water so harvested shall be optimally utilised.	Considering the prevailing topographical features of the site, the unit had created rain water harvesting ponds.
26.	The facilities to be constructed in the CRZ area as part of this project shall be strictly in conformity with the provisions of the CRZ Notification, 1991 and its amendment. The facilities such as office building and residential buildings which do not require water front and foreshore facilities shall not be constructed within the Coastal Regulation Zone area.	Complied.
GENERAL CONDITIONS		
	Construction of the proposed structures shall be undertaken meticulously conforming to the existing Central / local rules and regulations including Coastal	

Handwritten signature and circular stamp of the Ministry of Environment, Government of India.

1.	Regulation Notification 1991 and its amendments. All the construction designs / drawings relating to the proposed construction activities must have approvals of the concerned State Government Departments / Agencies.	Complied.
2.	Adequate provisions for infrastructure facilities such as water supply, fuel, sanitation etc. shall be ensured for construction workers during the construction phase of the project so as to avoid felling of trees / mangroves and pollution of water and the surroundings.	Complied.
3.	The project authorities shall make necessary arrangements for disposal of solid wastes and for the treatment of effluents by providing a proper wastewater treatment plant outside the CRZ area. The quality of treated effluents, solid wastes and noise level etc. must conform to the standards laid down by the competent authorities including the Central / State Pollution Control Board and the Union Ministry of Environment and Forests under the Environment [Protection] Act, 1986, whichever are more stringent.	Necessary arrangements such as Sewage and Effluent Treatment Plant were commissioned. The solid waste generated through Sewage Treatment Plant is being used as manure for our garden / green belt development. Hazardous Wastes are disposed as per our authorization no: 4380 dated 06/12/2013. Refer Annexure – 06 for Ambient Noise Level.
4.	The proponent shall obtain the requisite consents for discharge of effluents and emissions under the Water [Prevention and Control of Pollution] Act, 1974 and the Air [Prevention and Control Pollution] Act, 1981 from the Tamil Nadu State Pollution Control Board before commissioning of the project and a copy of each of these shall be sent to this Ministry.	The unit has received Consent to operate dated 16/11/2012. Subsequent Renewal of Consent to operate for every financial year is being done as per Air and Water act.
5.	In order to carry out the environment monitoring during the operational phase of the project, the project authorities shall establish an environmental laboratory well equipped with standard equipment and facilities and qualified manpower to carry out the testing of various environmental parameters.	All environmental related monitoring is being carried out through NABL, certified laboratories.
6.	The proponents shall provide for a regular monitoring mechanism so as to ensure that the treated effluents conform to the prescribed standards. The records of	The unit had commissioned Effluent Treatment Plant to treat the Trade Effluent generated during process activities. Since there is no trade

The image shows a handwritten signature in black ink over a circular official stamp. The stamp contains the text 'MINISTRY OF ENVIRONMENT AND FORESTS' and 'TAMIL NADU' around the perimeter. The signature is written in a cursive style across the stamp.

	analysis reports must be properly maintained and made available for inspection to the concerned State / Central officials during their visits.	effluent generation the ETP is not put into operation.
7.	The sand dunes and mangroves, if any, on the site shall not be disturbed in any way.	Complied.
8.	A copy of the clearance letter will be marked to the concerned Panchayat / local NGO, if any, from whom any suggestions / representation has been received while processing the proposal.	Complied.
9.	The Tamil Nadu Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's Office / Tehsildar's Office for 30 days.	Complied.
10.	The funds earmarked for environment protection measures shall be maintained, in a separate account and there shall be no diversion of these funds for any other purpose. A year wise expenditure on environmental safeguards shall be reported to this Ministry.	Noted.
11.	Full support shall be extended to the officers of this Ministry's Regional Office at Bangalore and the officers of the Central and State Pollution Control Boards by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities.	We are maintaining all details and reports in the current phase which is subjected to be produce in the event of inspection by authorities.
12.	In case of deviation or alteration in the project including the implementing agency, a fresh reference shall be made to this Ministry for modification in the clearance conditions or imposition of new ones for ensuring environmental protection.	Noted.
13.	This ministry reserve the right to revoke this clearance, if any of the modification in the clearance conditions or imposition of new ones for ensuring environmental protection.	Noted.
14.	The Ministry or any other competent authority may stipulate any other additional conditions subsequently, if	Noted.



	deemed necessary, for environmental protection, which shall be complied with.	
15.	The Project proponents shall inform the Regional Office at Bangalore as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of Land Development Work.	On the regular basis quarterly reports were forwarded to MoEF, Bangalore during the construction phase.
OTHER TERMS AND CONDITIONS		
1.	These stipulations would be enforced among others under the provisions of water [Prevention and Control of Pollution] Act, 1974 the Air [Prevention and Control of Pollution] Act, 1981, the Environment Hazardous Chemicals (Manufacture, Storage and Import) Rules, 1989, Municipal Solid Wastes (Management and Handling) Rules, 2000 and the Coastal Regulation zone Notification, 1991 and its subsequent amendments made there under from time to time.	Noted.
2.	All other statutory clearances such as the approvals for the storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	Noted.
3.	The project proponent should advertise in at least in two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Tamil Nadu Pollution Control Board and may also be seen on the web site of the Ministry of Environment & Forests at http://www.envfor.nic.in . The advertisement should be made within 10 days from the date of receipt of the clearance letter and a copy of the same should be forwarded to Regional Office of the Ministry at Bangalore.	The advertisement was made on 12 th of July 2009 in two local newspapers in Tamil and English. The same were communicated to MoEF through letter reference no. LTSB-09/MoEF/173 dated 25 th November 2006.



4.	Any appeal against this Environmental Clearance shall lie with the National Environmental Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.	Noted
5.	Status of compliance to the various stipulated environmental conditions and environmental safeguards will be uploaded by the project proponent in its website.	Noted.



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Annexure - 1 STP Treated Water Analytical Report

1.1 STP Treated Water Analytical Report

Table 1-1: L&T Ship port 30 KLD STP Outlet

Parameters	Unit	Method	Tolerance Limits for discharge of sewage effluent into Inland surface water	Report no.: GCS / W / 2057 /2014-2015	Report no.: GCS / W / 2156 /2014-2015	Report no.: GCS / W / 2248 /2014-2015	Report no.: GCS / W / 2318 /2014-2015	Report no.: GCS / W / 2409 /2014-2015	Report no.: GCS / W / 2409 /2014-2015
				Report date: 08.04.2014	Report date: 10.05.2014	Report date: 10.06.2014	Report date: 09.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Physical Parameters									
Colour	Hazen	IS 3025 Part 4: 1983 (Reaff. 2006)	-	12	10	10	13	20	15
Odour	-	IS 3025 Part 5: 1983 (Reaff. 2006)	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
pH @ 25°C	-	IS 3025 Part 11: 1983 (Reaff. 2006)	5.5-9	7.51	7.38	7.28	7.47	7.52	7.48
Temperature	°C	IS 3025 Part 9: 1984 (Reaff. 2006)	45°C @ the point of discharge	29	29	29	29	29	29
Particle Size of Suspended Solids	-	IS 3025 Part 20: 1984 (Reaff. 2006)	Shall pass 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve
Chemical Parameters									
Dissolved Solids	mg/l	IS 3025 Part 16: 1984 (Reaff. 2006)	2100	1410	1246	1192	1014	1146	1130
Suspended Solids		IS 3025 Part 17: 1984 (Reaff. 2006)	30	16	14	15	12	13	17
Chlorides as Cl		IS 3025 Part 32: 1988 (Reaff. 2009)	1000	433	398	324	305	356	349
Sulphate as SO ₃		IS 3025 Part 24: 1986 (Reaff. 2009)	1000	48	19	17	21	22	18
BOD 3 days @27°C		IS 3025 Part 44: 1993 (Reaff. 2009)	20	11	10	11	10	11	12
Oil & Grease		IS 3025 Part 39: 1991 (Reaff. 2009)	10	<1.0	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)	BDL (DL:1.0)

Parameters	Unit	Method	Tolerance Limits for discharge of sewage effluent into Inland surface water	Report no.: GCS / W / 2057 /2014-2015	Report no.: GCS / W / 2156 /2014-2015	Report no.: GCS / W / 2248 /2014-2015	Report no.: GCS / W / 2318 /2014-2015	Report no.: GCS / W / 2409 /2014-2015	Report no.: GCS / W / 2409 /2014-2015
				Report date: 08.04.2014	Report date: 10.05.2014	Report date: 10.06.2014	Report date: 09.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
COD		IS 3025 Part 58 - 2006	250	87	76	82	76	83	90
Arsenic as As		APHA 22nd Edn 3500 As	0.2	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Mercury as Hg		APHA 22nd Edn 3500 Hg	0	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Lead as Pb		APHA 22nd Edn 3500 Pb B	0.1	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Zinc as Zn		APHA 22nd Edn 3500 Zn B	1	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Copper as Cd		APHA 22nd Edn 3500 Cu B	3	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Cadmium as CD		APHA 22nd Edn 3500 Cd	2	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Nickel as Ni		IS 3025 Part 54 (Reaff. 2009)	3	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Cyanide as CN		APHA 22nd Edn 4500 CN	0.2	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Selenium as Se		IS 3025 Part 56 - 2003	0.1	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Pesticides		APHA 22nd Edn 6630-B	Absent	Nil	Nil	Nil	Nil	Nil	Nil
Phenolic Compounds as C ₆ H ₅ OH		IS 3025 Part 43 - 1992 (Reaff. 2009)	1	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)
Percent Sodium	%	APHA 22nd Edn 3500 Na B	-	52	53	52	51	50	47
Residual Sodium Carbonate		APHA 22nd Edn 3500 Na B	-	Nil	Nil	Nil	Nil	Nil	Nil
Sulphide as S	mg/l	IS 3025 Part 29 - 1986 (Reaff. 2009)	2	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
Boron as B		APHA 22nd Edn	2	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)

Parameters	Unit	Method	Tolerance Limits for discharge of sewage effluent into Inland surface water	Report no.: GCS / W / 2057 /2014-2015	Report no.: GCS / W / 2156 /2014-2015	Report no.: GCS / W / 2248 /2014-2015	Report no.: GCS / W / 2318 /2014-2015	Report no.: GCS / W / 2409 /2014-2015	Report no.: GCS / W / 2409 /2014-2015
				Report date: 08.04.2014	Report date: 10.05.2014	Report date: 10.06.2014	Report date: 09.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
		4500 B/B							
Total Chromium as Cr		APHA 22nd Edn 3500 Cr	2	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Hexavalent Chromium as Cr ⁶⁺		APHA 22nd Edn 3500 Cr	0.1	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Flouride as F		IS 3025 Part 60 - 2008	2	0.49	0.42	0.53	0.49	0.52	0.48
Dissolved phosphate as P		IS 3025 Part 31 - 1988 (Reaff. 2009)	5	0.97	0.87	0.76	0.63	0.67	0.62
Total Residual Chlorine		IS 3025 Part 26 - 1986 (Reaff. 2009)	1	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
Free Ammonia as NH ₃		IS 3025 Part 34 - 1988 (Reaff. 2009)	5	2.16	2.06	1.96	1.64	1.75	1.78
Ammonical Nitrogen as N		IS 3025 Part 34 - 1988 (Reaff. 2009)	50	6.23	6.14	6.05	5.92	6.09	6.01
Total Kjeldahl Nitrogen as N		IS 3025 Part 34 - 1988 (Reaff. 2009)	100	8.39	9.1	8.04	7.56	7.84	7.62

Table 1-2: Ship Building STP Outlet

Parameters	Unit	Reference Method	Tolerance Limits for discharge of sewage effluent into Inland surface water	Report No.: GCS / W / 2055 /2014-2015	Report No.: GCS / W / 2154 /2014-2015	Report No.: GCS / W / 2246 /2014-2015	Report No.: GCS / W / 2316 /2014-2015	Report no.: GCS / W / 2407 /2014-2015	Report no.: GCS / W / 2407 /2014-2015
				Report date: 08.04.2014	Report date: 10.05.2014	Report date: 10.06.2014	Report date: 09.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Physical Parameters									
Colour	Hazen	IS 3025 Part 4: 1983 (Reaff. 2006)	-	8	10	10	12	4	10
Odour	-	IS 3025 Part 5: 1983 (Reaff. 2006)	-	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
pH @ 25°C	-	IS 3025 Part 11: 1983 (Reaff. 2006)	5.5-9	7.53	7.86	7.73	7.81	7.92	7.68

Parameters	Unit	Reference Method	Tolerance Limits for discharge of sewage effluent into Inland surface water	Report No.: GCS / W / 2055 /2014-2015	Report No.: GCS / W / 2154 /2014-2015	Report No.: GCS / W / 2246 /2014-2015	Report No.: GCS / W / 2316 /2014-2015	Report no.: GCS / W / 2407 /2014-2015	Report no.: GCS / W / 2407 /2014-2015
				Report date: 08.04.2014	Report date: 10.05.2014	Report date: 10.06.2014	Report date: 09.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Temperature	°C	IS 3025 Part 9: 1984 (Reaff. 2006)	45°C @ the point of discharge	29	29	29	29	29	28
Particle Size of Suspended Solids	-	IS 3025 Part 20: 1984 (Reaff. 2006)	Shall pass 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve	Passes through 850 µ IS Sieve
Chemical Parameters									
Dissolved Solids	mg/l	IS 3025 Part 16: 1984 (Reaff. 2006)	2100.0	1758.0	1516.0	1402.0	1309.0	1360.0	1413.0
Suspended Solids		IS 3025 Part 17: 1984 (Reaff. 2006)	30.0	5.0	7.0	8.0	7.0	5.0	6.0
Chlorides as Cl		IS 3025 Part 32: 1988 (Reaff. 2009)	1000.0	530.0	528.0	472.0	483.0	472.0	387.0
Sulphate as SO ₃		IS 3025 Part 24: 1986 (Reaff. 2009)	1000.0	23.0	31.0	24.0	39.0	35.0	31.0
BOD 3 days @27°C		IS 3025 Part 44: 1993 (Reaff. 2009)	20.0	8.0	9.0	11.0	10.0	8.0	9.0
Oil & Grease		IS 3025 Part 39: 1991 (Reaff. 2009)	10.0	<1.0	<1.0	<1.0	<1.0	<1.0	BDL (DL:1.0)
COD		IS 3025 Part 58 - 2006	250.0	71.0	80.0	87.0	79.0	62.0	70.0
Arsenic as As		APHA 22nd Edn 3500 As	0.2	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Mercury as Hg		APHA 22nd Edn 3500 Hg	0.0	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Lead as Pb		APHA 22nd Edn 3500 Pb B	0.1	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Zinc as Zn		APHA 22nd Edn 3500 Zn B	1.0	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Copper as Cd		APHA 22nd Edn 3500 Cu B	3.0	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Cadmium as CD		APHA 22nd Edn 3500 Cd	2.0	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Nickel as Ni	IS 3025 Part 54	3.0	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	

Parameters	Unit	Reference Method	Tolerance Limits for discharge of sewage effluent into Inland surface water	Report No.: GCS / W / 2055 /2014-2015	Report No.: GCS / W / 2154 /2014-2015	Report No.: GCS / W / 2246 /2014-2015	Report No.: GCS / W / 2316 /2014-2015	Report no.: GCS / W / 2407 /2014-2015	Report no.: GCS / W / 2407 /2014-2015
				Report date: 08.04.2014	Report date: 10.05.2014	Report date: 10.06.2014	Report date: 09.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
		(Reaff. 2009)							
Cyanide as CN		APHA 22nd Edn 4500 CN	0.2	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Selenium as Se		IS 3025 Part 56 - 2003	0.1	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)	BDL (DL:0.01)
Pesticides		APHA 22nd Edn 6630-B	Absent	Nil	Nil	Nil	Nil	Nil	Nil
Phenolic Compounds as C ₆ H ₅ OH		IS 3025 Part 43 - 1992 (Reaff. 2009)	1.0	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)	BDL (DL:0.001)
Percent Sodium	%	APHA 22nd Edn 3500 Na B	-	48.0	49.0	50.0	51.0	50.0	52.0
Residual Sodium Carbonate		APHA 22nd Edn 3500 Na B	-	Nil	Nil	Nil	Nil	Nil	Nil
Sulphide as S		IS 3025 Part 29 - 1986 (Reaff. 2009)	2.0	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)	BDL (DL:0.5)
Boron as B		APHA 22nd Edn 4500 B/B	2.0	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
Total Chromium as Cr		APHA 22nd Edn 3500 Cr	2.0	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Hexavalent Chromium as Cr ⁶⁺		APHA 22nd Edn 3500 Cr	0.1	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)	BDL (DL:0.05)
Flouride as F	mg/l	IS 3025 Part 60 - 2008	2.0	0.46	0.43	0.46	0.43	0.45	0.49
Dissolved phosphate as P		IS 3025 Part 31 - 1988 (Reaff. 2009)	5.0	0.92	0.87	0.89	0.78	0.81	0.93
Total Residual Chlorine		IS 3025 Part 26 - 1986 (Reaff. 2009)	1.0	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)	BDL (DL:0.1)
Free Ammonia as NH ₃		IS 3025 Part 34 - 1988 (Reaff. 2009)	5.0	3.21	3.19	3.24	3.04	3.12	3.24
Ammonical Nitrogen as N		IS 3025 Part 34 - 1988 (Reaff. 2009)	50.0	6.93	6.87	6.93	6.72	6.83	6.97
Total Kjeldahl		IS 3025 Part 34 -	100.0	10.14	10.06	10.17	9.76	9.94	10.20

Parameters	Unit	Reference Method	Tolerance Limits for discharge of sewage effluent into Inland surface water	Report No.: GCS / W / 2055 /2014-2015	Report No.: GCS / W / 2154 /2014-2015	Report No.: GCS / W / 2246 /2014-2015	Report No.: GCS / W / 2316 /2014-2015	Report no.: GCS / W / 2407 /2014-2015	Report no.: GCS / W / 2407 /2014-2015
				Report date: 08.04.2014	Report date: 10.05.2014	Report date: 10.06.2014	Report date: 09.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Nitrogen as N		1988 (Reaff. 2009)							

Annexure - 2 DG Set Stack Emission Report

2.1 DG Set Stack Emission Report

Table 2-1: DG Set 2000 KVA

Parameters	Unit	Method	TNPCCB Standard - PM	Report no.: GCS/SM/1832 A/2014-2015	Report no.: GCS/SM/1832 A/2014-2015	Report no.: GCS/SM/1975 A/2014-2015	Report no.: GCS/SM/2017 A/2014-2015	Report no.: GCS/SM/2084 A/2014-2015	Report no.: GCS/SM/2352 B/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Total stack height from 'G' level	m	...		30	30	30	30	30	30
Port hole height from 'G' level	m	...		12	12	12	12	12	12
Stack Diameter	m	...		0.3	0.3	0.3	0.3	0.3	0.3
Ambient temperature	°C	IS 11255 Part 3 - 2008	150	31	30	32	30	30	30
Stack Temperature	°C	IS 11255 Part 3 - 2008		366	373	381	372	378	372
Flue gas Velocity	m/sec	IS 11255 Part 3 - 2008		21.7	20.6	21.4	21.7	22.3	21.5
Gaseous Emission	Nm ³ /hr	IS 11255 Part 3 - 2008		2575	2415	2479	2594	2595	2525
Particulate Matter (PM)	mg/Nm ³	IS 11255 Part 1 - 1985 (Reaff.2003)		47.6	45.3	46.4	49.3	53.2	41.4
Sulphour Di-Oxide (SO ₂)	mg/Nm ⁴	IS 11255 Part 1 - 1985 (Reaff.2003)		14.9	12.8	13.5	14.6	15	7.2
Oxides of Nitrogen (NO _x)	mg/Nm ⁵	IS 11255 Part 7 - 2005		58.3	61.4	62.8	59.8	62.4	84.7
Carbon Monoxide	%v/v	IS 13270: 1992 (Reaff.2009)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Table 2-2: DG Set 1250 KVA

Parameters	Unit	Method	TNPCCB Standards -PM	Report no.: GCS/SM/1832 B/2014-2015	Report no.: GCS/SM/1832 B/2014-2015	Report no.: GCS/SM/1975 B/2014-2015	Report no.: GCS/SM/2017 B/2014-2015	Report no.: GCS/SM/2084 B/2014-2015	Report no.: GCS/SM/2352 C/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Total stack height from 'G' level	m	...		30.0	30.0	30.0	30.0	30.0	30.0
Port hole height from 'G' level	m	...		12.0	12.0	12.0	12.0	12.0	12.0
Stack Diameter	m	...		0.3	0.3	0.3	0.3	0.3	0.3

Parameters	Unit	Method	TNPCCB Standards -PM	Report no.: GCS/SM/1832 B/2014-2015	Report no.: GCS/SM/1832 B/2014-2015	Report no.: GCS/SM/1975 B/2014-2015	Report no.: GCS/SM/2017 B/2014-2015	Report no.: GCS/SM/2084 B/2014-2015	Report no.: GCS/SM/2352 C/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Ambient temperature	°C	IS 11255 Part 3 - 2008	150	30.0	30.0	32.0	30.0	31.0	30.0
Stack Temperature	°C	IS 11255 Part 3 - 2008		321.0	332.0	340.0	326.0	334.0	327.0
Flue gas Velocity	m/sec	IS 11255 Part 3 - 2008		20.1	19.5	19.1	20.3	20.9	20.5
Gaseous Emission	Nm ³ /hr	IS 11255 Part 3 - 2008		2566.0	2440.0	2362.0	2612.0	2608.0	2588.0
Particulate Matter (PM)	mg/Nm ³	IS 11255 Part 1 - 1985 (Reaff.2003)		42.8	40.4	41.5	43.8	46.4	48.1
Sulphour Di-Oxide (SO ₂)	mg/Nm ⁴	IS 11255 Part 1 - 1985 (Reaff.2003)		14.6	13.3	12.6	13.2	12.9	7.0
Oxides of Nitrogen (NO _x)	mg/Nm ⁵	IS 11255 Part 7 - 2005		49.3	51.1	52.8	54.9	58.7	78.3
Carbon Monoxide	%v/v	IS 13270: 1992 (Reaff.2009)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Table 2-3: DG Set 100 KVA

Parameters	Unit	Method	TNPCCB Standards - PM	Report no.: GCS/SM/1832 C/2014-2015	Report no.: GCS/SM/1897 C/2014-2015	Report no.: GCS/SM/1975 C/2014-2015	Report no.: GCS/SM/2017 C/2014-2015	Report no.: GCS/SM/2084 C/2014-2015	Report no.: GCS/SM/2352 D/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Total stack height from 'G' level	m	...	150	12.0	12.0	12.0	12.0	12.0	12.0
Port hole height from 'G' level	m	...		12.0	12.0	12.0	12.0	12.0	12.0
Stack Diameter	m	...		0.1	0.1	0.1	0.1	0.1	0.1
Ambient temperature	°C	IS 11255 Part 3 - 2008		30.0	31.0	31.0	30.0	31.0	31.0
Stack Temperature	°C	IS 11255 Part 3 - 2008		157.0	143.0	147.0	136.0	129.0	134.0
Flue gas Velocity	m/sec	IS 11255 Part 3 - 2008		11.9	9.8	9.3	9.7	9.2	8.8
Gaseous Emission	Nm ³ /hr	IS 11255 Part 3 - 2008		233.0	195.0	186.0	195.0	193.0	181.0
Particulate Matter (PM)	mg/Nm ³	IS 11255 Part 1 - 1985 (Reaff.2003)		15.8	16.6	17.3	16.2	18.5	24.2
Sulphour Di-Oxide (SO ₂)	mg/Nm ⁴	IS 11255 Part 1 - 1985 (Reaff.2003)	10.2	10.4	9.5	8.3	9.0	6.5	
Oxides of Nitrogen (NO _x)	mg/Nm ⁵	IS 11255 Part 7 - 2005	33.7	30.8	31.6	36.8	38.4	61.6	
Carbon Monoxide	%v/v	IS 13270: 1992 (Reaff.2009)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	

Table 2-4: DG Set 2000 KVA - I Port

Parameters	Unit	Method	TNPCCB Standards - PM	Report no.: GCS/SM/1835 A/2014-2015	Report no.: GCS/SM/1900 A/2014-2015	Report no.: GCS/SM/1978 A/2014-2015	Report no.: GCS/SM/2020 A/2014-2015	Report no.: GCS/SM/2087 A/2014-2015	Report no.: GCS/SM/2355 A/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Total stack height from 'G' level	m	...		30.0	30.0	30.0	30.0	30.0	30.0
Port hole height from 'G' level	m	...		12.0	12.0	12.0	12.0	12.0	12.0
Stack Diameter	m	...		0.4	0.4	0.4	0.4	0.4	0.4
Ambient temperature	°C	IS 11255 Part 3 - 2008	150	31.0	30.0	31.0	30.0	31.0	30.0
Stack Temperature	°C	IS 11255 Part 3 - 2008		361.0	372.0	378.0	365.0	358.0	351.0
Flue gas Velocity	m/sec	IS 11255 Part 3 - 2008		22.8	23.6	23.7	22.8	21.6	20.9
Gaseous Emission	Nm ³ /hr	IS 11255 Part 3 - 2008		4849.0	4948.0	4956.0	4912.0	4610.0	4511.0
Particulate Matter (PM)	mg/Nm ³	IS 11255 Part 1 - 1985 (Reaff.2003)		47.5	49.1	48.4	51.6	54.2	42.3
Sulphour Di-Oxide (SO ₂)	mg/Nm ⁴	IS 11255 Part 2 - 1985 (Reaff.2003)		15.1	14.6	13.7	14.8	12.6	9.1
Oxides of Nitrogen (NO _x)	mg/Nm ⁵	IS 11255 Part 7 - 2005		52.4	54.0	55.9	57.3	67.4	87.5
Carbon Monoxide	%v/v	IS 13270: 1992 (Reaff.2009)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Table 2-5: DG Set 2000 KVA - II Port

Parameters	Unit	Method	TNPCCB Standards -PM	Report no.: GCS/SM/1835 B/2014-2015	Report no.: GCS/SM/1900 B/2014-2015	Report no.: GCS/SM/1978 B/2014-2015	Report no.: GCS/SM/2020 B/2014-2015	Report no.: GCS/SM/2087 B/2014-2015	Report no.: GCS/SM/2355 B/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Total stack height from 'G' level	m	...		30.0	30.0	30.0	30.0	30.0	30.0
Port hole height from 'G' level	m	...		12.0	12.0	12.0	12.0	12.0	12.0
Stack Diameter	m	...		0.4	0.4	0.4	0.4	0.4	0.4
Ambient temperature	°C	IS 11255 Part 3 - 2008	150	30.0	30.0	32.0	30.0	30.0	30.0
Stack Temperature	°C	IS 11255 Part 3 - 2008		355.0	360.0	367.0	372.0	365.0	368.0
Flue gas Velocity	m/sec	IS 11255 Part 3 - 2008		22.9	21.4	22.0	22.3	22.7	22.1
Gaseous Emission	Nm ³ /hr	IS 11255 Part 3 - 2008		4934.0	4552.0	4620.0	4539.0	4792.0	4643.0
Particulate Matter (PM)	mg/Nm ³	IS 11255 Part 1 - 1985 (Reaff.2003)		46.9	47.3	48.1	50.9	52.4	41.2

Parameters	Unit	Method	TNP CB Standards -PM	Report no.:	Report no.:	Report no.:	Report no.:	Report no.:	Report no.:
				GCS/SM/1835 B/2014-2015	GCS/SM/1900 B/2014-2015	GCS/SM/1978 B/2014-2015	GCS/SM/2020 B/2014-2015	GCS/SM/2087 B/2014-2015	GCS/SM/2355 B/2014-2015
				Report date:	Report date:	Report date:	Report date:	Report date:	Report date:
				07.04.2014	09.05.2014	10.06.2014	08.07.2014	06.08.2014	06.09.2014
Sulphur Di-Oxide (SO ₂)	mg/Nm ⁴	IS 11255 Part 2 - 1985 (Reaff.2003)		16.7	13.8	13.0	13.7	14.2	7.5
Oxides of Nitrogen (NO _x)	mg/Nm ⁵	IS 11255 Part 7 - 2005		57.2	50.6	51.6	56.4	62.9	89.4
Carbon Monoxide	%v/v	IS 13270: 1992 (Reaff.2009)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Annexure - 3 Ambient Air Quality Analysis Report

3.1 Ambient Air Quality Analysis Report

Table 3-1: Port Work Shop Area

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1834 A/2014-2015	Report No.: GCS/SM/1898 A/2014-2015	Report No.: GCS/SM/1977 A/2014-2015	Report No.: GCS/SM/2019 A/2014-2015	Report No.: GCS/SM/2086 A/2014-2015	Report No.: GCS/SM/2354 A./2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
PM ₁₀	µg/m ³	IS 5182 : Part 23 - 2006	100	60	57	59	57	59	52
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	26	25	26	23	25	17
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	8	7.6	7.8	8.2	7.9	7.1
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	18.9	18.5	18.2	17.5	18.1	14.4
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:1.0)
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Table 3-2: Gate Complex

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1834 B/2014-2015	Report No.: GCS/SM/1898 B/2014-2015	Report No.: GCS/SM/1978 B/2014-2015	Report No.: GCS/SM/2019 B/2014-2015	Report No.: GCS/SM/2086 B/2014-2015	Report No.: GCS/SM/2354 B/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
PM ₁₀	µg/m ³	IS 5182 : Part 23 - 2006	100	56	54	53	56	53	51
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	22	23	21	22	21	12

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1834 B/2014-2015	Report No.: GCS/SM/1898 B/2014-2015	Report No.: GCS/SM/1978 B/2014-2015	Report No.: GCS/SM/2019 B/2014-2015	Report No.: GCS/SM/2086 B/2014-2015	Report No.: GCS/SM/2354 B/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	9.1	8.7	8.3	8.6	8.2	6.7
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	18.4	18.6	18.6	18.1	18.6	11.4
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:1.0)
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Table 3-3: Near CFS

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1834 C/2014-2015	Report No.: GCS/SM/1898 C/2014-2015	Report No.: GCS/SM/1977 C/2014-2015	Report No.: GCS/SM/2019 C/2014-2015	Report No.: GCS/SM/2086 C/2014-2015	Report No.: GCS/SM/2354 C/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
PM ₁₀	μg/m ³	IS 5182 : Part 23 - 2006	100	46	43	44	42	45	41
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	18	17	18	17	18	11
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	7.3	7.5	7.9	6.9	7.4	6.8
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	18.7	18.2	18	16.4	16.9	16.3
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:1.0)
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1834 C/2014-2015	Report No.: GCS/SM/1898 C/2014-2015	Report No.: GCS/SM/1977 C/2014-2015	Report No.: GCS/SM/2019 C/2014-2015	Report No.: GCS/SM/2086 C/2014-2015	Report No.: GCS/SM/2354 C/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Table 3-4: Near Wharf CB2

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1834 D/2014-2015	Report No.: GCS/SM/1898 D/2014-2015	Report No.: GCS/SM/1977 D/2014-2015	Report No.: GCS/SM/2019 D/2014-2015	Report No.: GCS/SM/2086 D/2014-2015	Report No.: GCS/SM/2354 D/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
PM ₁₀	µg/m ³	IS 5182 : Part 23 - 2006	100	49	48	47	51	48	50
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	22	20	19	20	19	16
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	7.6	8.2	7.6	7.3	7.6	7.1
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	18.8	19.1	18.4	16.7	17.3	15.6
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:1.0)
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Table 3-5: Plate Cutting Area

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1831 A/2014-2015	Report No.: GCS/SM/1895 A/2014-2015	Report No.: GCS/SM/1974 A/2014-2015	Report No.: GCS/SM/2016 A/2014-2015	Report No.: GCS/SM/2083 A/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014
PM ₁₀	µg/m ³	IS 5182 : Part 23 - 2006	100	61	63	64	61	63
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	27	26	28	26	27
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	8.1	8.4	8	8.3	8
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	18.4	18.7	18.7	17.2	17.8
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Table 3-6: Near Main Gate

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1831 B/2014-2015	Report No.: GCS/SM/1895 B/2014-2015	Report No.: GCS/SM/1974 B/2014-2015	Report No.: GCS/SM/2016 B/2014-2015	Report No.: GCS/SM/2083 B/2014-2015	Report No.: GCS/SM/2351 B/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
PM ₁₀	µg/m ³	IS 5182 : Part 23 - 2006	100	60	59	60	63	66	56
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	26	24	24	25	28	15
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	9.4	8.7	8.9	8	8.9	7.7
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	18.8	18.4	18.3	17.8	18.3	14.1
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:1.0)

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1831 B/2014-2015	Report No.: GCS/SM/1895 B/2014-2015	Report No.: GCS/SM/1974 B/2014-2015	Report No.: GCS/SM/2016 B/2014-2015	Report No.: GCS/SM/2083 B/2014-2015	Report No.: GCS/SM/2351 B/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Table 3-7: Near STP

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1831 C/2014-2015	Report No.: GCS/SM/1895 C/2014-2015	Report No.: GCS/SM/1974 C/2014-2015	Report No.: GCS/SM/2016 C/2014-2015	Report No.: GCS/SM/2083 C/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014
PM ₁₀	µg/m ³	IS 5182 : Part 23 - 2006	100	51	52	54	56	54
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	18	20	21	22	23
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	7.7	7.3	7.6	6.9	7.2
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	18.2	18.5	18.8	16.3	16.9
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Table 3-8: Near Fresh Water Reservoir Tank

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Report No.: GCS/SM/1831 D/2014-2015	Report No.: GCS/SM/1895 D/2014-2015	Report No.: GCS/SM/1974 D/2014-2015	Report No.: GCS/SM/2016 D/2014-2015	Report No.: GCS/SM/2083 D/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014
PM ₁₀	µg/m ³	IS 5182 : Part 23 - 2006	100	52	54	56	52	50
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	20	21	23	20	21
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	7.5	7	7.5	6.7	6.9
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	17.9	18.3	18.6	17.2	17.5
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)	BDL(DL:0.2)
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Table 3-9: Wood Cutting Shop, Near Substation-I and Near Substation-II

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Wood Cutting Shop	Near Substation-I	Near Substation-II
				Report No.: GCS/SM/2351 A/2014-2015	Report No.: GCS/SM/2351 C/2014- 2015	Report No.: GCS/SM/2351 D/2014- 2015
				Report date: 06.09.2014	Report date: 06.09.2014	Report date: 06.09.2014
PM ₁₀	µg/m ³	IS 5182 : Part 23 - 2006	100	51	48	46
PM _{2.5}		CEPA - ARB - SOP - MLD 055	60	16	17	17
Oxides of Sulphur as SO ₂		IS 5182 : Part 2 - 2001	80	7.3	6.1	6.5
Oxides of Nitrogen as NO ₂		IS 5182 : Part 6 - 2006	80	13.9	15.6	15.8
Leas as Pb		IS 5182 : Part 22 - 2004	1	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)

Parameters	Unit	Reference Methods	NAAQ Standards (Industrial, Residential & Rural Area)	Wood Cutting Shop	Near Substation-I	Near Substation-II
				Report No.: GCS/SM/2351 A/2014-2015	Report No.: GCS/SM/2351 C/2014- 2015	Report No.: GCS/SM/2351 D/2014- 2015
				Report date: 06.09.2014	Report date: 06.09.2014	Report date: 06.09.2014
Carbon monoxide as CO		IS 5182 : Part 10 - 1999	4	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)
Ozone as O ₃		IS 5182 : Part 9 - 1974	180	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)
Ammonia as NH ₃		APHA 2nd Edn. 401	400	BDL(DL:10)	BDL(DL:10)	BDL(DL:10)
Benzene as C ₆ H ₆		IS 5182 : Part 11 - 2006	5	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Benzene (α) Pyrene		IS 5182 : Part 12 - 2004	1	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)
Arsenic as As		EPA IO - 3.2	6	BDL(DL:1)	BDL(DL:1)	BDL(DL:1)
Nickel as Ni		APHA 2nd Edn. 320	20	BDL(DL:5)	BDL(DL:5)	BDL(DL:5)

Annexure - 4 VOC Measurements Report

4.1 VOC Measurements Report

Table 4-1: Paint Booth (Shop No.30) and Paint Booth Scrubber Stack

Parameters	Unit	Reference Method	VOC-Volatile organic compound	As per OSHA	Paint Booth (Shop No.30)					
					Report No.: GCS.SM/1832 G/2014-2015	Report No.: GCS.SM/1897 G/2014-2015	Report No.: GCS.SM/1975 G/2014-2015	Report No.: GCS.SM/2017 G/2014-2015	Report No.: GCS/SM/2084 G/2014-2015	Report No.: GCS/SM/2352 H/2014-2015
					Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
VOC as MEK	PPM	NIOSH	MEK-Methyl Ethyl Ketone	200	<25	<25	No Process Work	No Process Work	<25	<25
					Paint Booth Scrubber Stack					
					Report No.: GCS.SM/1832 E/2014-2015	Report No.: GCS.SM/1897 E/2014-2015	Report No.: GCS/SM/1975 E/2014-2015	Report No.: GCS/SM/2017 E/2014-2015	Report No.: GCS/SM/2084 E/2014-2015	Report No.: GCS/SM/2352 F/2014-2015
					Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
					<25	<25	<25	<25	<25	<25

Annexure - 5 Process Stack Emission Report

5.1 Process Stack Emission Report

Table 5-1: Shop No. 30

Parameters	Unit	Reference Methods	TNPCB Standards - PM - mg/Nm ³	Report No.: GCS/SM/1 832 F/2014-2015 Report date: 07.04.2014	Report No.: GCS/SM/1 897 F/2014-2015 Report date: 09.05.2014	Report No.: GCS/SM/1 975 F/2014-2015 Report date: 10.06.2014	Report No.: GCS/SM/2 017 F/2014-2015 Report date: 08.07.2014	Report No.: GCS/SM/2 084 F/2014-2015 Report date: 06.08.2014	Report No.: GCS/SM/2 352 G./2014-2015 Report date: 06.09.2014
Total stack height from 'G' Level	m	---	150	18	18	18	18	18	18
Port Hole height from 'G' Level	m	---		8	8	8	8	8	8
Stack Diameter	m	---		0.5	0.5	0.5	0.5	0.5	0.5
Ambient Temperature	⁰ C	IS 11255 Part 3-2008		30	30	31	31	30	31
Stack Temperature	⁰ C	IS 11255 Part 3-2008		38	36	37	36	38	36
Flue gas velocity	m/sec	IS 11255 Part 3-2008		14.3	14.8	14.13	14.3	13.1	13.5
Gaseous Emission	Nm ³ /hr	IS 11255 Part 3-2008		9680	10085	9593	9937	8864	9194
Particulate Matter (PM)	mg/Nm ³	IS 11255 Part 1-1985 (Reaff.2003)		14.9	13	13.7	11.5	9.2	8.8
Sulphur Di-Oxide (SO ₂)	mg/Nm ³	IS 11255 Part 2-1985 (Reaff.2003)		6.3	5.9	5.4	5.1	5.6	6
Oxides of Nitrogen (NO _x)	mg/Nm ³	IS 11255 Part 7-2005		8.1	7.5	7.8	7.4	7.8	7.2
Carbon Monoxide (CO)	%v/v	IS 13270: 1992 (Reaff.2009)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Table 5-2: Blasting Scrubber

Parameters	Unit	Reference Methods	TNPCCB Standard - PM - mg/Nm ³	Report No.: GCS/SM/1832 D/2014-2015	Report No.: GCS/SM/1897 D/2014-2015	Report No.: GCS/SM/1975 D/2014-2015	Report No.: GCS/SM/2017 D/2014-2015	Report No.: GCS/SM/2084 D/2014-2015	Report No.: GCS/SM/2352 E/2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Total stack height from 'G' Level	m	---	150	17	17	17	17	17	17
Port Hole height from 'G' Level	m	---		6	6	6	6	6	6
Stack Diameter	m	---		0.5	0.5	0.5	0.5	0.5	0.5
Ambient Temperature	°C	IS 11255 Part 3-2008		31	31	31	30	30	31
Stack Temperature	°C	IS 11255 Part 3-2008		36	35	37	36	39	38
Flue gas velocity	m/sec	IS 11255 Part 3-2008		15.5	16.1	15.22	15.4	16.2	16.7
Gaseous Emission	Nm ³ /hr	IS 11255 Part 3-2008		10562	10946	10335	10705	10926	11300
Particulate Matter (PM)	mg/Nm ³	IS 11255 Part 1-1985 (Reaff.2003)		10.8	11	10.5	9.7	7.9	7.5
Sulphur Di-Oxide (SO ₂)	mg/Nm ³	IS 11255 Part 2-1985 (Reaff.2003)		5.6	4.7	5.2	5.4	5.7	5.1
Oxides of Nitrogen (NO _x)	mg/Nm ³	IS 11255 Part 7-2005		7	6.8	7.1	7.3	6.8	6.3
Carbon Monoxide (CO)	%v/v	IS 13270: 1992 (Reaff.2009)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

Annexure - 6 Ambient Noise Level Report

6.1 Ambient Noise Level Report

Table 6-1: Near Work Shop Area

Parameters	Unit	Reference Methods	TNPCCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/18 36 /2014-2015	Report No.: GCS/S/NLM/18 99 /2014-2015	Report No.: GCS/S/NLM/19 79 /2014-2015	Report No.: GCS/S/NLM/20 21 /2014-2015	Report No.: GCS/S/NLM/20 88 /2014-2015	Report No.: GCS/S/NLM/23 56 /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	71.5	70.7	70.3	61.8	63.5	61.6
L _{max}				73.6	73.2	72.8	63.2	65.8	67.1
L _{min}				68.3	67.9	68.3	59.4	59	52.8

Table 6-2: Near Gate Complex

Parameters	Unit	Reference Methods	TNPCCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/18 36 /2014-2015	Report No.: GCS/S/NLM/18 99 /2014-2015	Report No.: GCS/S/NLM/19 79 /2014-2015	Report No.: GCS/S/NLM/20 21 /2014-2015	Report No.: GCS/S/NLM/20 88 /2014-2015	Report No.: GCS/S/NLM/23 56 /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	66.4	64.9	65.2	66.4	68.2	62.3
L _{max}				69.1	68.5	69	70.3	71.2	71.5
L _{min}				64.8	61.5	61.8	62.1	63.7	55

Table 6-3: Near DG 2000 KVA -1

Parameters	Unit	Reference Methods	TNPCCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/18 36 /2014-2015	Report No.: GCS/S/NLM/18 99 /2014-2015	Report No.: GCS/S/NLM/19 79 /2014-2015	Report No.: GCS/S/NLM/20 21 /2014-2015	Report No.: GCS/S/NLM/20 88 /2014-2015	Report No.: GCS/S/NLM/23 56 /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument	75	70.7	71.4	71.7	71.4	71	69.1

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/18 36 /2014-2015	Report No.: GCS/S/NLM/18 99 /2014-2015	Report No.: GCS/S/NLM/19 79 /2014-2015	Report No.: GCS/S/NLM/20 21 /2014-2015	Report No.: GCS/S/NLM/20 88 /2014-2015	Report No.: GCS/S/NLM/23 56 /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{max}		Manual		72.8	73.3	73.5	72.2	72.5	72.8
L _{min}				68.5	68.8	68.4	67.9	68.3	64.7

Table 6-4: Near DG 2000 KVA -2

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/18 36 /2014-2015	Report No.: GCS/S/NLM/18 99 /2014-2015	Report No.: GCS/S/NLM/19 79 /2014-2015	Report No.: GCS/S/NLM/20 21 /2014-2015	Report No.: GCS/S/NLM/20 88 /2014-2015	Report No.: GCS/S/NLM/23 56 /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	71.3	71.8	71.9	71.8	71.4	70.7
L _{max}				73	73.6	73.8	73.6	73	73.1
L _{min}				69.2	69	68.7	68.5	68.9	62.1

Table 6-5: Near Main Gate

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/18 33 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	71.6	70.4	70.7	69.7	68.5	60.1
L _{max}				72.8	72.1	73	71.3	69.8	70.6
L _{min}				66.2	64.9	66.2	65.4	64.7	56

Table 6-6: Near Fresh Water Reservoir Tank

Parameters	Unit	Reference Methods	TNPCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	65.7	66.6	67.4	46.3	47.2	48.8
L _{max}				67.4	68.3	69.2	48.4	49.5	50.3
L _{min}				61.9	62.4	62.8	42.7	41.6	43.5

Table 6-7: Plate Cutting Area

Parameters	Unit	Reference Methods	TNPCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	70.8	68.2	68.6	60.8	62.4	63.4
L _{max}				73.1	72.7	72.3	63.2	65.8	66
L _{min}				69.5	65.6	64.7	55.8	57.9	59.1

Table 6-8: Near STP

Parameters	Unit	Reference Methods	TNPCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	62.4	61.7	62.8	53.2	55.1	56.7
L _{max}				66.7	65.2	66.1	55.8	58.6	59.9
L _{min}				58	57.3	57.9	49.5	51.4	52.6

Table 6-9: Near DG 2000 KVA

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/1833 A/2014-2015	Report No.: GCS/S/NLM/1896 /2014-2015	Report No.: GCS/S/NLM/1976 /2014-2015	Report No.: GCS/S/NLM/2018 /2014-2015	Report No.: GCS/S/NLM/2085 /2014-2015	Report No.: GCS/S/NLM/2353 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	72.6	70.9	71.2	71.5	71	70.5
L _{max}				73.4	73	73.6	73.2	72.3	71.9
L _{min}				69.8	66.8	67.3	68.1	67.6	68.2

Table 6-10: Near DG 100 KVA

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/1833 A/2014-2015	Report No.: GCS/S/NLM/1896 /2014-2015	Report No.: GCS/S/NLM/1976 /2014-2015	Report No.: GCS/S/NLM/2018 /2014-2015	Report No.: GCS/S/NLM/2085 /2014-2015	Report No.: GCS/S/NLM/2353 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	66.2	65.3	66.5	67.8	68.5	68.3
L _{max}				69.8	69.1	69.8	69.4	70.7	70
L _{min}				67.1	63.5	63	65.3	64.2	67.4

Table 6-11: Scrap Yard

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/1833 A/2014-2015	Report No.: GCS/S/NLM/1896 /2014-2015	Report No.: GCS/S/NLM/1976 /2014-2015	Report No.: GCS/S/NLM/2018 /2014-2015	Report No.: GCS/S/NLM/2085 /2014-2015	Report No.: GCS/S/NLM/2353 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	60.8	61.4	61.7	62.9	63.4	64.9
L _{max}				64.4	64.9	65.3	66.8	67.7	68.3
L _{min}				55.6	54.5	55.6	57.3	59.3	60

Table 6-12: Ship Repair

Parameters	Unit	Reference Methods	TNPCCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	66.3	67	68.1	69.7	68.8	64.1
L _{max}				69.7	70.2	70.9	71.3	71	69.6
L _{min}				63.2	63.7	64.5	67.5	66.9	62.4

Table 6-13: Pipe Shop

Parameters	Unit	Reference Methods	TNPCCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	64.9	63.8	64.4	65.2	67.5	66.7
L _{max}				69.3	68.6	68	66.9	69.4	68
L _{min}				61.8	61	61.3	62.7	64.8	63.8

Table 6-14: Shop No.13

Parameters	Unit	Reference Methods	TNPCCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	64.9	57.1	57.8	61.7	62.9	63.4
L _{max}				69.3	59.4	59.6	64.2	65.6	66.1
L _{min}				61.8	52.8	53.1	58.9	59.5	58.6

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
Observation				No Hampering Operation			No Hampering Operation	No Hampering Operation	

Table 6-15: Shop No.16

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	68.2	69.4	68.6	70.6	70.1	66.6
L _{max}				70.6	71.7	70.8	72.6	72.3	70.9
L _{min}				64.2	65.3	64.3	69	68.7	62.3

Table 6-16: Shop No.17

Parameters	Unit	Reference Methods	TNPCC Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	69.4	67.6	67	71.4	71.9	70.3
L _{max}				71.3	69.5	68.5	73.4	73.5	71.2
L _{min}				66.7	63.6	62.9	69.3	69.4	67.7

Table 6-17: PSV-3

Parameters	Unit	Reference Methods	TNPCB Standards - (Industrial Area)	Report No.: GCS/S/NLM/183 3 A/2014-2015	Report No.: GCS/S/NLM/18 96 /2014-2015	Report No.: GCS/S/NLM/19 76 /2014-2015	Report No.: GCS/S/NLM/20 18 /2014-2015	Report No.: GCS/S/NLM/20 85 /2014-2015	Report No.: GCS/S/NLM/23 53 A /2014-2015
				Report date: 07.04.2014	Report date: 09.05.2014	Report date: 10.06.2014	Report date: 08.07.2014	Report date: 06.08.2014	Report date: 06.09.2014
L _{eq}	dB(A)	Instrument Manual	75	63.7	62.9	63.5	70.1	69.6	68.8
L _{max}				66.4	65.8	66.2	71.5	70.2	70.5
L _{min}				62.6	60.2	59.7	68.4	66	64.9

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Company Name:		PIN Code:		City: Bangalore		PIN Code: 560034	
Address:		State:		Description of Contents:		Value of Goods:	
City: Bangalore		State: OC		Description of Contents:		Value of Goods:	
Sender's VAT / GST (if applicable):		Total Value of Goods ₹		Shipment Type: Doc		Total Netm. Pcs:	
4		5 Declared Value for Carriage ₹		Risk Coverage: Owner <input type="checkbox"/> Carrier <input type="checkbox"/>		6 DIM 2-L: cm X cm X cm	
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Total Amount (a+b+c)		9		10		11	
₹ in words		9		10		11	
Mode of Payment: Cash <input type="checkbox"/> Credit Card <input type="checkbox"/>		9		10		11	

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Company Name:		PIN Code:		City: Delhi		PIN Code: 110003	
Address:		State:		Description of Contents:		Value of Goods:	
City: Delhi		State: OC		Description of Contents:		Value of Goods:	
Sender's VAT / GST (if applicable):		Total Value of Goods ₹		Shipment Type: Doc		Total Netm. Pcs:	
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6 Value Added Services: Not Available		7 7.3 Mode: Surface		8 Charges: Amount (₹)		9 I/We declare that this consignment does not contain personal mail, cash, jewellery, contraband, illegal drugs, any prohibited items and commodities which can cause safety hazards while transported by air	
8 a) Tariff (incl. OF SC & ST)		9		Sender's Signature: M. Vijay Baskar		10 Working Branch Name / Code, Address	
b) Risk Surcharge		9		Date: 08/10		11 Please call us on 3300444 from your city, prefiling STD code of our nearest customer service centre located in Kolkata, Ahmedabad, Mumbai, Pune, Nagpur, Hyderabad, Bengaluru, Chennai and Kochi and on 4400000 to contact our Delhi customer service centre. Visit us at www.dtcd.com for more information	
c) Service Tax on b		9		Time: AM/PM		11	
Total Amount (a+b+c)		9		10		11	
₹ in words		9		10		11	
Mode of Payment: Cash <input type="checkbox"/> Credit Card <input type="checkbox"/>		9		10		11	

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Sender's Name: M. Vijay Baskar		Ph:		Address: Ch		City: Ch	
Company Name:		PIN Code:		City: Ch		PIN Code: 58	
Address:		State:		Description of Contents:		Value of Goods:	
City: Ch		State: OC		Description of Contents:		Value of Goods:	
Sender's VAT / GST (if applicable):		Total Value of Goods ₹		Shipment Type: Doc		Total Netm. Pcs:	
4		5 Declared Value for Carriage ₹		Risk Coverage: Owner <input type="checkbox"/> Carrier <input type="checkbox"/>		6 DIM 2-L: cm X cm X cm	
6 Value Added Services: Not Available		7 7.3 Mode: Surface		8 Charges: Amount (₹)		9 I/We declare that this consignment does not contain personal mail, cash, jewellery, contraband, illegal drugs, any prohibited items and commodities which can cause safety hazards while transported by air	
8 a) Tariff (incl. OF SC & ST)		9		Sender's Signature: M. Vijay Baskar		10 Working Branch Name / Code, Address	
b) Risk Surcharge		9		Date: 08/10		11 Please call us on 3300444 from your city, prefiling STD code of our nearest customer service centre located in Kolkata, Ahmedabad, Mumbai, Pune, Nagpur, Hyderabad, Bengaluru, Chennai and Kochi and on 4400000 to contact our Delhi customer service centre. Visit us at www.dtcd.com for more information	
c) Service Tax on b		9		Time: AM/PM		11	
Total Amount (a+b+c)		9		10		11	
₹ in words		9		10		11	
Mode of Payment: Cash <input type="checkbox"/> Credit Card <input type="checkbox"/>		9		10		11	

Send DTDC CONSIGNMENT No. To 9845324040 For SMS Tracking. Visit us at: www.dtcd.com | E-mail: ccs.co@dtcd.com | SENDER COPY | Jan-14 Release

Appendix - B

CRZ/EC Validity Extension and Amendment
Letter

F.No. 10-130/2007-IA.III
 Government of India
 Ministry of Environment, Forests & Climate Change
 (IA-III Section)

Indira Peryavaran Bhawan,
 Jor Bagh Road,
 New Delhi - 110 003

Dated: 17th December, 2014

To

M/s L&T Ship Building Limited,
 Ports Division, TC-1, InfoTech Gate,
 No.22, Mount Poonamallee Road,
 Chennai - 600 089, Tamil Nadu

Fax No. 044-2270 6579

E-mail: ygr@ntidpl.com

Subject: Extension of validity and amendment in CRZ and Environmental Clearance dated 03.07.2009 granted for the development of Shipyard cum Minor port complex at Kattupalli, Ponneri Taluka, Tiruvallur District, Tamil Nadu by M/s L&T Ship Building Limited (LTSB) - Reg.

Sir,

This has reference to your letter No. LTSB/PORTS/111 dated 05.05.2014 seeking amendment to the CRZ and Environmental Clearance dated 03.07.2009 under EIA Notification, 2006 and CRZ Notification, 2011 and letter dated 26.05.2014 seeking extension of validity of clearance dated 03.07.2009.

2. The L&T Shipbuilding Limited (LTSB), a joint venture between Tamil Nadu Industrial Development Corporation Limited (TIDCO) and L&T, was accorded CRZ and Environmental Clearance for the project by the Ministry of Environment & Forests (MoEF) vide letter No.10-130/2007-IA.III dated 03.07.2009. The Environmental and CRZ Clearance was issued for the development of Shipyard cum Minor port complex at Kattupalli, Ponneri Taluka, Tiruvallur District, Tamil Nadu.

3. The issue was discussed by the EAC in its meetings held on 30th June, 2014 - 2nd July, 2014 and 25th - 27th August, 2014 and committee recommended for the extension of validity of the clearance dated 03.07.2009 for a period of five years. Accordingly, the validity of the clearance dated 03.07.2009 is extended up to 02.07.2019. All other conditions remain unchanged.

4. Project Proponent informed that the LTSB proposes to strengthen their traffic by handling Automobile (Ro-Ro) and Liquid Non-hazardous cargo and revised traffic of Project/Break Bulk Cargo in addition to Containers, General Cargo and Break bulk etc., which are currently being handled at the developed facilities. The prior Clearance was obtained for about 25.0 MTPA which includes 2.0 Million TEUs per Annum of Container (around 24.0 MTPA) and 0.5 MTPA of Steel Cargo and 0.5 MTPA of Project Cargo/Break bulk/General Cargo. Based on the present traffic projections the total traffic volume is about 24.65 MTPA. The proposed handling capacity will be well within the capacity for which prior Clearance is obtained. As such, no revision in the port layout is envisaged due to handling of the proposed cargo, except for re-allocating storage areas for the mentioned cargo. The total cost of project is Rs. 40 crores.




(i) Container 21.60 MTPA, (ii) Ro-Ro - 0.22 MTPA, (iii) Project cargo-0.44 MTPA, (iv) Break bulk/General Cargo (Barytes/Gypsum/Limestone/Granite/Steel cargo)-1.82 MTPA and (v) Edible oil, CBFS, Base Oil and Lube oil and non-hazardous liquid cargo - 0.57 MTPA.

5. The Tamil Nadu Coastal Zone Management Authority (TNCZMA) recommended the proposal for amendment vide letter no. 6064/EC.3/2014-1 dated 26.06.2014.

6. The EAC, after due consideration of the relevant documents submitted by the project proponent and additional clarifications furnished in response to its observations viz. quantity of cargo to be handled along with details on storage and pollution control measures, details of safety measures for liquid cargo and details of transportation of cargoes, have recommended the proposal for amendment in CRZ and Environmental Clearance to handle revised cargo traffic within the approved capacity. Accordingly, Ministry hereby accords amendment to the Clearance dated 03.07.2009 and stipulates the following conditions:

- (i) The cargo should only include (i) Container 21.60 MTPA, (ii) Ro-Ro - 0.22 MTPA, (iii) Project cargo-0.44 MTPA, (iv) Break bulk/General Cargo (Barytes/Gypsum/Limestone/Granite/Steel cargo)-1.82 MTPA and (v) Edible oil, CBFS, Base Oil and Lube oil and non-hazardous liquid cargo - 0.57 MTPA.
- (ii) All the conditions stipulated by the Tamil Nadu Coastal Zone Management Authority (TNCZMA) vide letter no. 6064/EC.3/2014-1 dated 26.06.2014, shall be strictly complied with.
- (iii) No additional land should be utilized for the proposed development.
- (iv) As committed, the local traffic should not be disturbed.

7. All other conditions shall remain unchanged in accordance with the Environmental and CRZ Clearance provided vide letter No. 10 130/2007-1A-III dated 03.07.2009.


(Dr. Manoranjan Hota)
Director

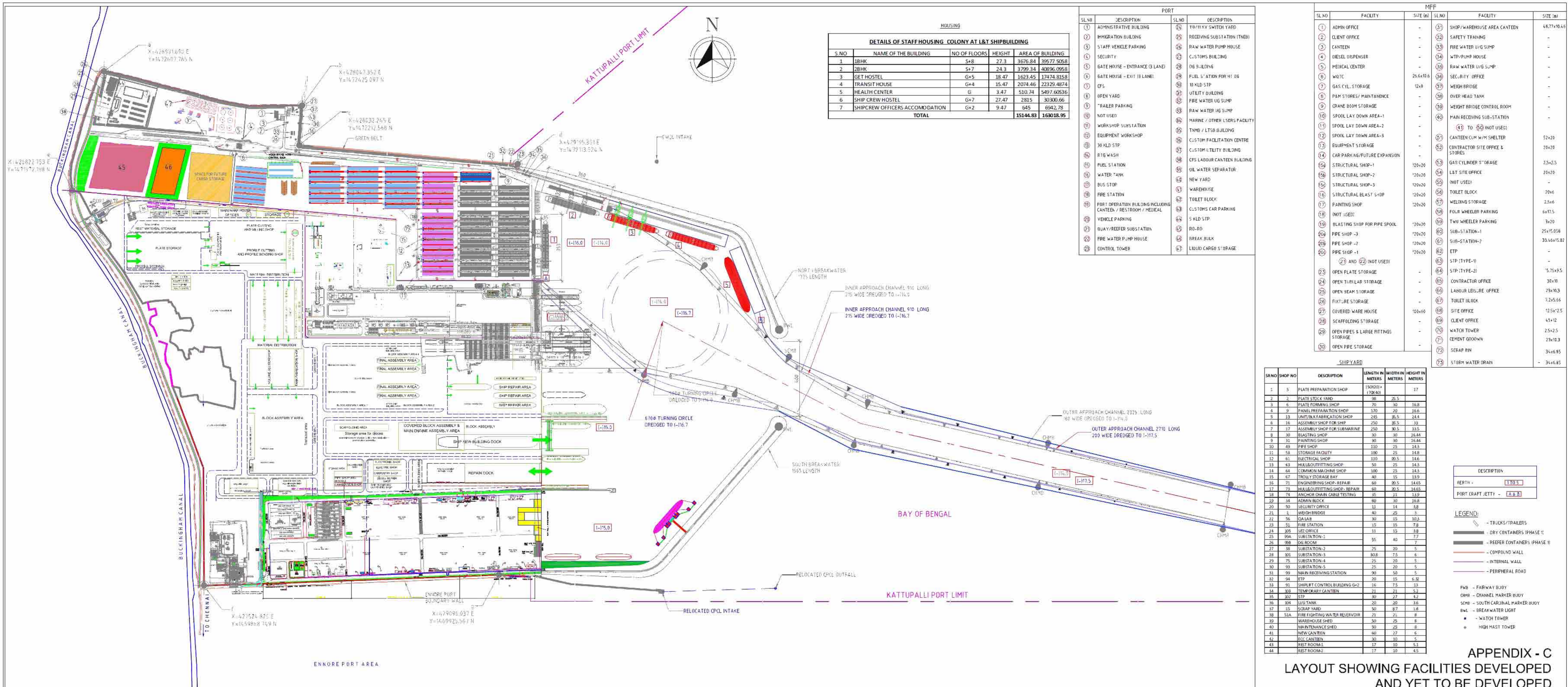
Copy to.

- (1) The Principal Secretary, Department of Environment and Forests, First Floor, Panagal Building, Saidapet, Chennai - 600 015, Tamil Nadu.
- (2) The Chairman, CPCB, Parivesh Bhawan, CBD-cum Office Complex, East Arjun Nagar, Delhi - 110032.
- (3) The Director, Department of Environment, Government of Tamilnadu, Panagal Building, Ground Floor, Saidapet, Chennai-15, Tamil Nadu.
- (4) The Chairman, Tamil Nadu Pollution Control Board, No. 76, Mount Salai, Gundy, Chennai, Tamil Nadu.
- (5) The CCF, Regional Office, MoEF&CC (SZ), Kendriya Sadan, 14th floor, E&F wings, 17th Main Road, Koramangala II Block, Bangalore - 560 034.
- (6) Guard File.
- (7) Monitoring Cell.


(Dr. Manoranjan Hota)
Director

Appendix – C

*Layout Showing Facilities Developed and yet
to be Developed*



HOUSING

DETAILS OF STAFF HOUSING COLONY AT L&T SHIPBUILDING

S.NO	NAME OF THE BUILDING	NO OF FLOORS	HEIGHT	AREA OF BUILDING
1	1BHK	S+8	27.3	3676.84
2	2BHK	S+7	24.3	3799.34
3	GET HOSTEL	G+5	18.47	1623.45
4	TRANSIT HOUSE	G+4	15.47	2074.46
5	HEALTH CENTER	G	3.47	5497.60536
6	SHIP CREW HOSTEL	G+7	27.47	2815
7	SHIPCREW OFFICERS ACCOMODATION	G+2	9.47	645
TOTAL				15144.83

PORT		MFF	
SLNO	DESCRIPTION	SLNO	DESCRIPTION
1	ADMINISTRATIVE BUILDING	25	10/11 KV SWITCH YARD
2	IMMIGRATION BUILDING	26	RECEIVING SUBSTATION (TNB)
3	STAFF VEHICLE PARKING	27	RAW WATER PUMP HOUSE
4	SECURITY	28	CUSTOMS BUILDING
5	GATE HOUSE - ENTRANCE (B LANE)	29	DG BUILDING
6	GATE HOUSE - EXIT (B LANE)	30	FUEL STATION FOR HT DG
7	CFS	31	10 KLD STP
8	OPEN YARD	32	UTILITY BUILDING
9	TRAILER PARKING	33	FIRE WATER U/G SUMP
10	NOT USED	34	RAW WATER U/G SUMP
11	WORKSHOP SUBSTATION	35	MARINE / OTHER USERS FACILITY
12	EQUIPMENT WORKSHOP	36	TNMS / LTSS BUILDING
13	30 KLD STP	37	CUSTOM FACILITATION CENTRE
14	RTS WASH	38	CUSTOM UTILITY BUILDING
15	FUEL STATION	39	CFS LABOUR CANTEN BUILDING
16	WATER TANK	40	OIL WATER SEPARATOR
17	BUS STOP	41	NEW YARD
18	FIRE STATION	42	WAREHOUSE
19	PORT OPERATION BUILDING INCLUDING CANTEN / RESTROOM / MEDICAL	43	TOILET BLOCK
20	VEHICLE PARKING	44	CUSTOMS CAR PARKING
21	QUAY/REEFER SUBSTATION	45	5 KLD STP
22	FIRE WATER PUMP HOUSE	46	RO-RO
23	CONTROL TOWER	47	BREAK BULK
		48	LIQUID CARGO STORAGE

SRNO	SHOP NO	DESCRIPTION	LENGTH IN METERS	WIDTH IN METERS	HEIGHT IN METERS
1	3	PLATE PREPARATION SHOP	15000+ (170x40)	17	
2	2	PLATE STOCK YARD	38	25.5	
3	6	PLATE FORMING SHOP	70	30	16.8
4	9	PANEL PREPARATION SHOP	170	20	16.6
5	13	UNIT/BLK FABRICATION SHOP	245	36.5	14.4
6	16	ASSEMBLY SHOP FOR SHIP	250	30.5	13
7	17	ASSEMBLY SHOP FOR SUBMARINE	250	30.5	13.5
8	30	BLASTING SHOP	30	30	16.44
9	31	PAINTING SHOP	30	30	16.44
10	49	PIPE SHOP	110	25	14.3
11	58	STORAGE FACILITY	100	25	14.8
12	61	ELECTRICAL SHOP	110	20.5	14.6
13	63	HULLS OUTFITTING SHOP	50	25	14.3
14	64	COMMON MACHINE SHOP	100	25	14.3
15	67	TROLLEY STORAGE BAY	40	15	13.9
16	71	ENGINEERING SHOP-REPAIR	60	20.5	14.65
17	73	HULLS OUTFITTING SHOP-REPAIR	60	20.5	14.65
18	74	ANCHOR CHAIN CABLE TESTING	35	21	13.9
19	34	ADMIN BLOCK	60	30	16.8
20	50	SECURITY OFFICE	11	14	3.8
21	1	WEIGH BRIDGE	40	25	3
22	36	GAS LAB	30	15	10.2
23	51	FIRE STATION	15	15	7.8
24	105	SEZ OFFICE	11	15	3.8
25	99A	SUBSTATION-1	25	20	7.7
26	96B	DG ROOM	95	40	7
27	38	SUBSTATION-2	25	20	5
28	801	SUBSTATION-3	80.8	7.5	6
29	75	SUBSTATION-4	25	20	5
30	33	SUBSTATION-5	25	20	5
31	99	MAIN RECEIVING STATION	90	50	5
32	94	ETP	20	15	6.32
33	91	SHIPPLT CONTROL BUILDING G+2	16	7.5	13
34	103	TEMPORARY CANTEN	21	21	5.2
35	102	STP	30	27	4.2
36	104	U/G TANK	20	20	3.6
37	15	SCRAP YARD	50	8.7	1.6
38	51A	FIRE FIGHTING WATER RESERVOIR	21	21	8
39		WAREHOUSE SHED	50	25	8
40		MAINTENANCE SHED	50	25	8
41		NEW CANTEN	40	27	6
42		ECC CANTEN	30	10	5
43		REST ROOM-1	17	10	5.1
44		REST ROOM-2	17	10	4.5

DESCRIPTION

BERTH - [T to S]

PORT CRAFT JETTY - [A & B]

LEGEND:

- TRUCKS/TRAILERS
- DRY CONTAINERS (PHASE II)
- REEFER CONTAINERS (PHASE II)
- COMPOUND WALL
- INTERNAL WALL
- PERIPHERAL ROAD

FWB - FARWAY BUOY
 CHMB - CHANNEL MARKER BUOY
 SCMB - SOUTH CARDINAL MARKER BUOY
 BWL - BREAKWATER LIGHT
 * - WATCH TOWER
 * - HIGH MAST TOWER

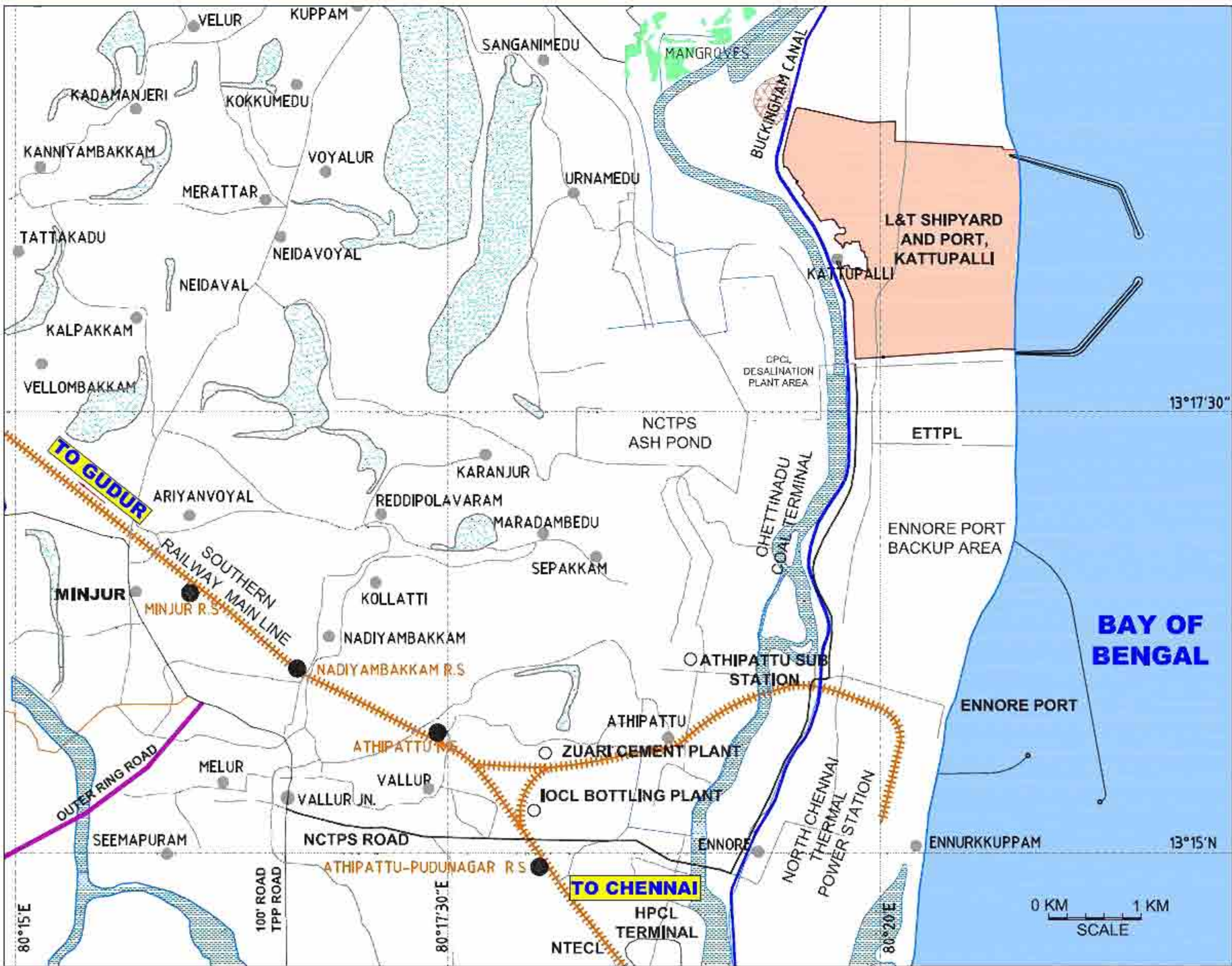
APPENDIX - C
LAYOUT SHOWING FACILITIES DEVELOPED
AND YET TO BE DEVELOPED

Appendix – D
Location Map

KEYMAP -INDIA



TAMIL NADU STATE KEY MAP



**APPENDIX -D
LOCATION MAP**

Appendix – E

Survey Numbers of Kattupalli Shipyard Cum
Port

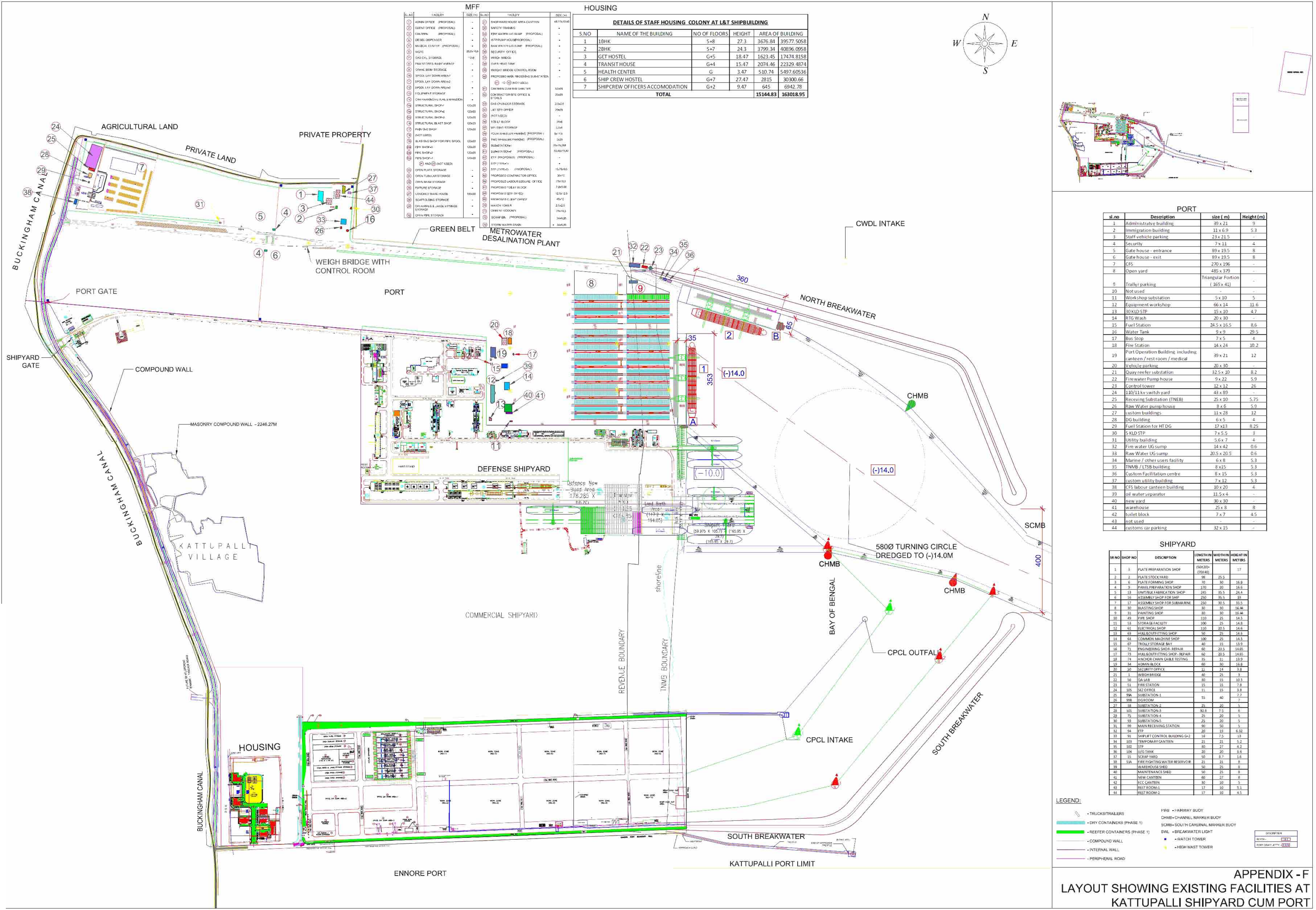
Appendix E Survey Numbers of Kattupalli Shipyard cum Port

Table E-1: Survey Numbers of Kattupalli Shipyard cum Port

S.No	Village	Survey Numbers
1	Kattupalli, Ponneri Taluk	2, 4, 7, 9, 18, 19, 20, 21, 25, 27, 28, 30, 31pt, 32B, 33, 34, 35, 36, 39B, 40, 41, 42, 43B, 44, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 58, 59, 60, 61, 62, 66, 67, 68, 70, 71, 72, 73, 74, 75, 76, 77, 84, 85, 87, 88, 89, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 110, 111, 112, 113, 114, 115, 116, 117, 118, 120, 121, 124, 126, 127, 130, 131, 133, 134, 135, 136, 137, 138, 139, 141, 142, 144, 146, 147, 148, 149, 150, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 331, 14, 15, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 199, 200, 202, 203, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 242, 243, 244, 247, 248, 249, 198, 205, 1 (part), 11 (part), 16 (part), 17 (part), 143 (part), 151 (part), 152 (part), 153 (part), 154 (part), 166 (part), 167 (part), 204 (part), 221 (part), 222 (part), 330 (part)

Appendix – F

*Layout Showing Existing Facilities at
Kattupalli Shipyard Cum Port*



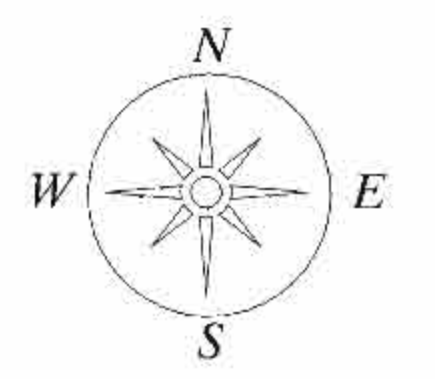
MFF

S.NO	FACILITY	SEE (M)	S.NO	FACILITY	SEE (M)
1	ADMIN OFFICE (PROPOSAL)	-	20	PROPOSED HOUSE AREA CANTINE	48.75/30.95
2	CLIENT OFFICE (PROPOSAL)	-	21	SAFETY (STAIRS)	-
3	CARPITAL (PROPOSAL)	-	22	FIRE WATER LUG SUMP (PROPOSAL)	-
4	DIESEL OPERATOR	-	23	WATER TOWER (PROPOSAL)	-
5	MEDICAL CENTRE (PROPOSAL)	-	24	RAW WATER LUG SUMP (PROPOSAL)	-
6	WC	28.5/1.5	25	SECURITY OFFICE	-
7	DNS CYL STORAGE	12.0	26	WFO-3MESH	-
8	PLANT OFFICE (PROPOSAL)	-	27	WFO-HEAD TANK	-
9	DOME BOMB STORAGE	-	28	HEALTH MEDICAL CONTROL ROOM	-
10	SPOOL LAY DOWN AREA-2	-	29	PROPOSED MAR. RECEIVING SUBSTATION	-
11	SPOOL LAY DOWN AREA-3	-	30	CONTRACTOR OFFICE & STORES	50/70
12	EQUIPMENT STORAGE	-	31	GAS OIL BUNKER STORAGE	23.5/2
13	SM WAREHOUSE (PLANT & EQUIPMENT)	-	32	LAT SITE OFFICE	70/70
14	STRUCTURAL SHOP-1	12/20	33	(NOT USED)	-
15	STRUCTURAL SHOP-2	12/20	34	ICELET BLOCK	25/6
16	STRUCTURAL SHOP-3	12/20	35	WFO-3MESH	23/6
17	PAINT SHOP	12/20	36	FOUR WHEELER GARAGE (PROPOSAL)	30/15
18	(NOT USED)	-	37	TWO WHEELER PARKING (PROPOSAL)	30
19	BLAS (NO) SHOP FOR PIPE SPOOL	12/20	38	SUBSTATION	25/10/20
20	PIPE SHOP-2	12/20	39	SUBSTATION (PROPOSAL)	15/40/15/30
21	PIPE SHOP-1	12/20	40	RTF (PROPOSAL)	-
22	(NOT USED)	-	41	RTF (PROPOSAL)	-
23	OPEN PLATE STORAGE	-	42	RTF (PROPOSAL)	15/70/60
24	OPEN TUBULAR STORAGE	-	43	PROPOSED CONTRACTOR OFFICE	30/15
25	OPEN BRAM STORAGE	-	44	PROPOSED LABOUR KITCHEN OF FICE	25/10/3
26	PEPPER STORAGE	-	45	PROPOSED TOLBY BLOCK	12/5.08
27	COVERED WARE HOUSE	10/30	46	PROPOSED OFFICE (OFFICE)	12/5/12.5
28	SCAFFOLDING STORAGE	-	47	PROPOSED C.B.P. OFFICE	45/12
29	CRANES & LAMP LIFTING STORAGE	-	48	WAREHOUSE	25/2.5
30	OPEN PIPE STORAGE	-	49	CEMENT STOCKPILE	70/10
31	(NOT USED)	-	50	STORAGE (PROPOSAL)	30/10
32	(NOT USED)	-	51	STORAGE (PROPOSAL)	30/10
33	(NOT USED)	-	52	STORAGE (PROPOSAL)	30/10
34	(NOT USED)	-	53	STORAGE (PROPOSAL)	30/10
35	(NOT USED)	-	54	STORAGE (PROPOSAL)	30/10
36	(NOT USED)	-	55	STORAGE (PROPOSAL)	30/10
37	(NOT USED)	-	56	STORAGE (PROPOSAL)	30/10
38	(NOT USED)	-	57	STORAGE (PROPOSAL)	30/10
39	(NOT USED)	-	58	STORAGE (PROPOSAL)	30/10
40	(NOT USED)	-	59	STORAGE (PROPOSAL)	30/10
41	(NOT USED)	-	60	STORAGE (PROPOSAL)	30/10
42	(NOT USED)	-	61	STORAGE (PROPOSAL)	30/10
43	(NOT USED)	-	62	STORAGE (PROPOSAL)	30/10
44	(NOT USED)	-	63	STORAGE (PROPOSAL)	30/10
45	(NOT USED)	-	64	STORAGE (PROPOSAL)	30/10
46	(NOT USED)	-	65	STORAGE (PROPOSAL)	30/10
47	(NOT USED)	-	66	STORAGE (PROPOSAL)	30/10
48	(NOT USED)	-	67	STORAGE (PROPOSAL)	30/10
49	(NOT USED)	-	68	STORAGE (PROPOSAL)	30/10
50	(NOT USED)	-	69	STORAGE (PROPOSAL)	30/10
51	(NOT USED)	-	70	STORAGE (PROPOSAL)	30/10
52	(NOT USED)	-	71	STORAGE (PROPOSAL)	30/10
53	(NOT USED)	-	72	STORAGE (PROPOSAL)	30/10
54	(NOT USED)	-	73	STORAGE (PROPOSAL)	30/10
55	(NOT USED)	-	74	STORAGE (PROPOSAL)	30/10
56	(NOT USED)	-	75	STORAGE (PROPOSAL)	30/10
57	(NOT USED)	-	76	STORAGE (PROPOSAL)	30/10
58	(NOT USED)	-	77	STORAGE (PROPOSAL)	30/10
59	(NOT USED)	-	78	STORAGE (PROPOSAL)	30/10
60	(NOT USED)	-	79	STORAGE (PROPOSAL)	30/10
61	(NOT USED)	-	80	STORAGE (PROPOSAL)	30/10
62	(NOT USED)	-	81	STORAGE (PROPOSAL)	30/10
63	(NOT USED)	-	82	STORAGE (PROPOSAL)	30/10
64	(NOT USED)	-	83	STORAGE (PROPOSAL)	30/10
65	(NOT USED)	-	84	STORAGE (PROPOSAL)	30/10
66	(NOT USED)	-	85	STORAGE (PROPOSAL)	30/10
67	(NOT USED)	-	86	STORAGE (PROPOSAL)	30/10
68	(NOT USED)	-	87	STORAGE (PROPOSAL)	30/10
69	(NOT USED)	-	88	STORAGE (PROPOSAL)	30/10
70	(NOT USED)	-	89	STORAGE (PROPOSAL)	30/10
71	(NOT USED)	-	90	STORAGE (PROPOSAL)	30/10
72	(NOT USED)	-	91	STORAGE (PROPOSAL)	30/10
73	(NOT USED)	-	92	STORAGE (PROPOSAL)	30/10
74	(NOT USED)	-	93	STORAGE (PROPOSAL)	30/10
75	(NOT USED)	-	94	STORAGE (PROPOSAL)	30/10
76	(NOT USED)	-	95	STORAGE (PROPOSAL)	30/10
77	(NOT USED)	-	96	STORAGE (PROPOSAL)	30/10
78	(NOT USED)	-	97	STORAGE (PROPOSAL)	30/10
79	(NOT USED)	-	98	STORAGE (PROPOSAL)	30/10
80	(NOT USED)	-	99	STORAGE (PROPOSAL)	30/10
81	(NOT USED)	-	100	STORAGE (PROPOSAL)	30/10

HOUSING

DETAILS OF STAFF HOUSING COLONY AT L&T SHIPBUILDING

S.NO	NAME OF THE BUILDING	NO OF FLOORS	HEIGHT	AREA OF BUILDING
1	1BHK	S+8	27.3	3676.84
2	2BHK	S+7	24.3	3799.34
3	GET HOSTEL	G+5	18.47	1623.45
4	TRANSIT HOUSE	G+4	15.47	2074.46
5	HEALTH CENTER	G	3.47	510.74
6	SHIP CREW HOSTEL	G+7	27.47	2815
7	SHIP CREW OFFICERS ACCOMODATION	G+2	9.47	645
TOTAL				15144.83
				16301.95



PORT

S.No	Description	Size (m)	Height (m)
1	Administrative building	20 x 21	9
2	Immigration building	11 x 6.9	5.3
3	Staff vehicle parking	23 x 21.5	-
4	Security	7 x 11	4
5	Gate house - entrance	89 x 19.5	8
6	Gate house - exit	89 x 19.5	8
7	CPS	270 x 196	-
8	Open yard	485 x 379	-
9	Trailer parking	Triangular Portion (165 x 41)	-
10	Not used	-	-
11	Workshop substation	5 x 10	5
12	Equipment workshop	66 x 14	11.6
13	30KLD STP	15 x 10	4.7
14	RTG Wash	20 x 30	-
15	Fuel Station	24.5 x 16.5	8.6
16	Water Tank	9 x 9	29.5
17	Bus Stop	7 x 5	4
18	Fire Station	14 x 24	10.2
19	Port Operation Building including canteen / rest room / medical	20 x 21	12
20	Vehicle parking	20 x 30	-
21	Quay reefer substation	32.5 x 30	8.2
22	Fire water Pump house	9 x 22	5.9
23	Control tower	12 x 12	26
24	110/11 kv switch yard	43 x 89	-
25	Receiving Substation (TNEB)	25 x 10	5.75
26	Raw Water pump house	8 x 6	5.9
27	Custom buildings	11 x 28	3.2
28	DG building	6 x 5	4
29	Fuel Station for HT DG	17 x 13	8.25
30	5 KLD STP	7 x 5.5	3
31	Utility building	5.6 x 7	4
32	Fire water LUG sump	14 x 42	0.6
33	Raw Water LUG sump	20.5 x 20.5	0.6
34	Marine / other users facility	6 x 8	5.3
35	TNMB / LTSB building	8 x 15	5.3
36	Custom Facility centre	8 x 15	5.3
37	Custom utility building	7 x 12	5.3
38	CPS labour canteen building	10 x 20	4
39	oil water separator	11.5 x 4	-
40	new yard	30 x 30	-
41	warehouse	25 x 8	8
42	toilet block	7 x 7	4.5
43	not used	-	-
44	customs car parking	32 x 15	-

SHIPYARD

Sr No	Shop No	Description	Length in METERS	Width in METERS	Height in METERS
1	5	PLATE PREPARATION SHOP	150.00	17	17
2	2	PLATE STOCK YARD	98	25.5	3
3	6	PLATE FORMING SHOP	70	30	16.8
4	9	PLATE PREPARATION SHOP	170	30	16.8
5	13	UNIT/BLK FABRIKATION SHOP	245	35.5	24.4
6	16	ASSEMBLY SHOP FOR SHIP	250	35.5	33
7	17	ASSEMBLY SHOP FOR SUBMARINE	250	30.5	33.5
8	30	BLASTING SHOP	30	30	16.44
9	31	PAINTING SHOP	30	30	16.44
10	49	PIPE SHOP	120	25	14.3
11	53	STORAGE FACILITY	100	25	14.8
12	61	ELECTRICAL SHOP	120	30.5	14.6
13	63	HEAVY LIFTING SHOP	50	25	14.8
14	64	COMMON MACHINE SHOP	100	25	14.3
15	67	TROLLEY STORAGE BAY	40	15	13.9
16	71	ENGINEERING SHOP - REPAIR	60	30.5	14.65
17	73	HEAVY LIFTING SHOP - REPAIR	60	30.5	14.65
18	74	ANCHOR CHAIN CABLE TESTING	35	31	13.9
19	84	ALUMINUM RACK	60	30	16.8
20	90	SECURITY OFFICE	11	14	3.8
21	1	WBGH BRIDGE	40	25	3
22	36	DRY LAB	80	15	10.8
23	51	FIRE STATION	15	15	7.8
24	505	SEZ OFFICE	11	15	3.8
25	99A	SUBSTATION-1	55	40	7.7
26	99B	DIS ROOM	25	20	5
27	98	SUBSTATION-2	25	20	5
28	901	SUBSTATION-3	30.8	7.5	6
29	75	SUBSTATION-4	25	20	5
30	99	SUBSTATION-5	25	20	5
31	99	MAIN RECEIVING STATION	90	50	5
32	94	FTP	20	15	6.32
33	91	SHIP LIFT CONTROL BUILDING G+2	18	7.5	23
34	103	TEMPORARY CANTINE	21	21	5.2
35	102	STP	30	27	4.2
36	104	LUG TANK	20	20	8.6
37	15	DISP. YARD	50	8.7	1.6
38	10A	FIRE FIGHTING WATER RESERVOIR	20	21	8
39		WAREHOUSE SHED	50	25	8
40		MAINTENANCE SHED	50	25	8
41		NEW CANTINE	60	27	8
42		BECC CANTINE	30	10	5
43		REST ROOM-1	17	10	5.1
44		REST ROOM-2	17	10	4.5

- LEGEND:**
- TRUCKS/TRAILERS
 - DRY CONTAINERS (PHASE 1)
 - REEFER CONTAINERS (PHASE 1)
 - COMPOUND WALL
 - MASONRY COMPOUND WALL
 - INTERNAL WALL
 - PERIPHERAL ROAD
 - FAINWAY BUOY
 - CHANNEL MARKER BUOY
 - SOUTH CARPULAN MARKER BUOY
 - BREAKWATER LIGHT
 - WATCH TOWER
 - HIGH MAST TOWER

APPENDIX - F
LAYOUT SHOWING EXISTING FACILITIES AT KATTUPALLI SHIPYARD CUM PORT

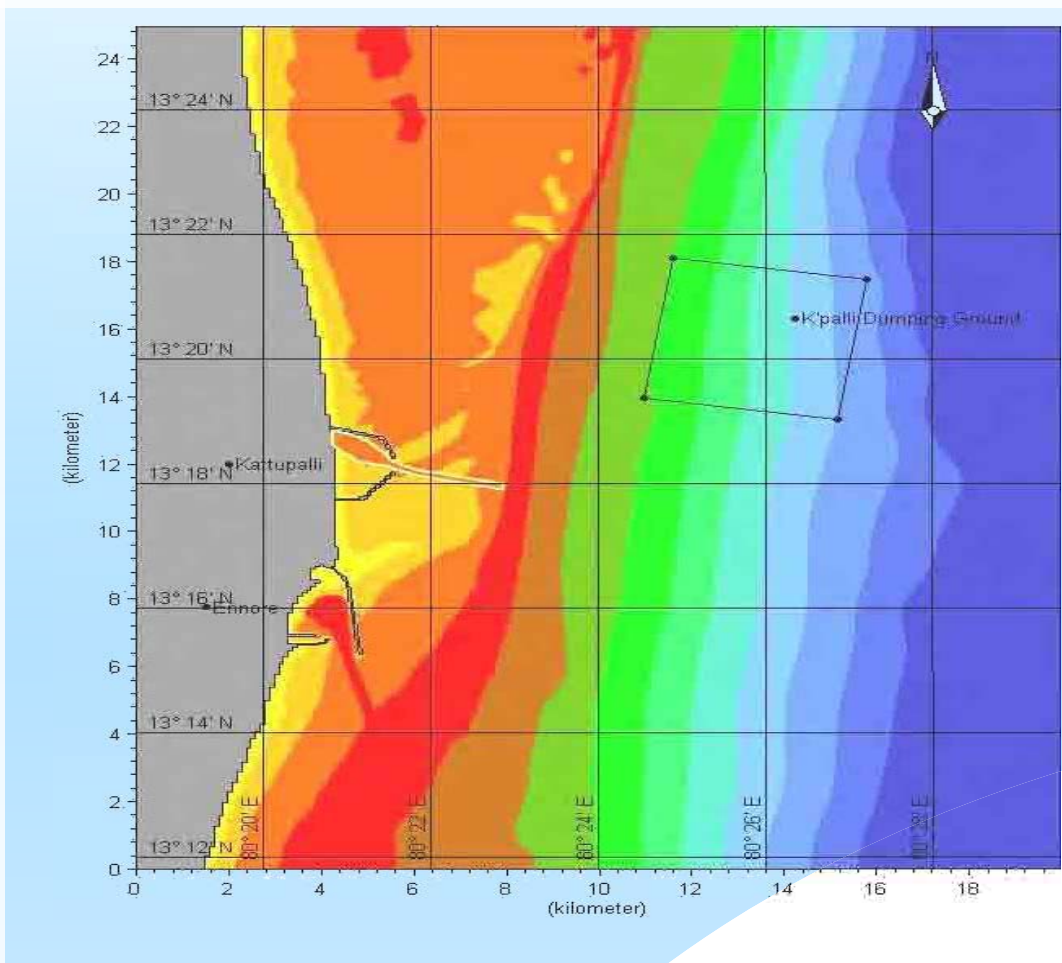


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L&T SHIPBUILDING LIMITED

AMENDMENT TO ENVIRONMENTAL/ CRZ CLEARANCE FOR KATTUPALLI SHIPYARD CUM PORT



Dredge Spoil Disposal Study

March 2015

Submitted By



L&T Infrastructure Engineering Limited

(formerly known as L&T-Ramboll Consulting Engineers Limited)



L&T Infra Engineering

L&T Infrastructure Engineering Ltd.

Client: L&T Shipbuilding Limited

Project: Amendment to Environmental/CRZ Clearance for Kattupalli Shipyard cum Port	Project No.: C1141307
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Title: Dredge Spoil Disposal Study	Document No.: RP001	Rev.: 0
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1 Introduction

L&T Shipbuilding Limited (LTSB), a joint venture between Tamil Nadu Industrial Development Corporation Limited (TIDCO) and L&T, has developed Shipyard cum Port Complex at Kattupalli, Thiruvallur District, Tamil Nadu. LTSB has obtained the Environmental/CRZ Clearance vide Letter No. 10-130/2007-IA.III dated July 03, 2009 and Tamil Nadu Pollution Control Board (TNPCB) has accorded Consent to Operate (CTO) dated November 16, 2012 and renewal dated July 04, 2013.

The development plan as envisaged during EIA study for which Environmental/CRZ Clearance was obtained has not been completely developed due to economic slowdown. The following facilities were only developed:

- Two Breakwaters (North breakwater: 1775 m; South breakwater: 1665 m)
- Navigational Channel (Outer channel: Length: 2325 m; Width:180 m; Depth(-)14 CD and Inner channel: Length:910 m; Width:215 m; Depth(-)14 CD)
- Two cargo berths (CB-1: Length: 353 m; Width: 35 m; Depth: (-) 14.0 m CD and CB – 2: Length: 360m; Width: 65 m; Depth: (-) 14.0 m CD)
- Container freight station in port area
- Ship lift and outfitting Jetties
- Blasting, painting, plate preparation/forming, assembly, fabrication shops in shipyard area
- Modular fabrication facility (MFF) consisting of quay wall up to 84 m, work zones; spool lay down area; storage areas and blasting/painting shops
- Buildings and utilities & services in port, shipyard and MFF area
- Dredging of 8.0 MCM, disposal of 2.0 MCM at offshore disposal area and reclamation of backup area with 6.0 MCM of dredged material was carried out.
- Greenbelt development

The following facilities are yet to be developed for which CRZ/ Environmental Clearance was obtained:

- Development of 3 Cargo Berths and 2 Port Craft Berths
- Extension of container storage, tank farms, navigation facilities
- Dredging of Port areas from (-)14.0 m to (-)16.7 m and Navigation Channel from (-)14.0 m to (-)17.5 m as per Master Plan
- Extension of blasting, painting, plate preparation/forming, assembly, fabrication shops in shipyard area
- Dredging the Shipyard Area (from (-) 10 m to (-) 15 m) in a phased manner
- Outfitting jetties/dry docks/storage areas in shipyard area.
- Extension of quay wall, development of berths/outfitting jetties in MFF area
- Dredging the MFF Area (from (-) 6 m to (-) 15 m in a phased manner and Immediate Dredging up to (-12 m) is envisaged
- Offshore disposal of dredged material at the identified Dumping Site in a phased manner depends on the requirement. (16 MCM)
- Augmentation of buildings and utilities & services in port, shipyard and MFF area
- Greenbelt development

LTSB has commissioned its operations on January 30, 2013 with developed facilities and envisages the development of remaining facilities in next five years. LTSB sought for an Extension of Validity of Environmental/ CRZ Clearance for the facility yet to be developed and the same was recommended by Ministry of Environment, Forest and Climate Change

(MoEF&CC) vide Letter No: **F.No. 10-130/2007-IA.III dated December 17, 2014** along with amendment to handle revised cargo traffic at the Kattupalli Port.

LTSB intends to undertake some of the dredging activities, for which EC is already obtained as stated above, in a phased manner in the immediate future. This involves disposal of 16MCM of dredged material at offshore dumping site. The dumping is proposed to be carried out in different phases presented as follows:

- Immediate Dumping (Mid of 2015) of about 2.5 MCM from dredging the MFF Area (from (-) 6 m to (-) 12 m)
- Dumping of another 2.5 MCM (2016-17) from the dredging the same MFF Area (from (-) 12 m to (-) 15 m).
- Apart from above the following are other dumping requirements which will be carried out in a phased manner based on the business growth within 5 years as approved in CRZ/EC Validity extension application.
 - Dumping of another 5.0 MCM from dredging the Shipyard Area (from (-)10 m to 15 m) in a phased manner depends on the requirement.
 - Dumping of another 6.0 MCM from dredging of Port areas from (-)14.0 m to (-)16.7 m and Navigation Channel from (-)14.0 m to (-)17.5 m as per Master Plan

Considering this requirement, LTSB analysed the adequacy of existing dumping site (1.0x1.5 km) located about 4km NE of the Kattupalli port where water depth varies between 25 to 30m. The existing dumping site is designed for 2MCM dredge spoil and the proposed dumping of 16MCM at this site will make the area shallower and may modify the hydrodynamics of the area and also hinder the movement of large size vessel's navigation in future phases of project. Hence, it is suggested to extend dumping site (starts with Eastern Corner of existing dumping site) towards deeper water (between 30 m to 55 m contour) in order to maintain the natural depth with minimal variations.

With this background LTSB has carried out the model study to evaluate the impact of dumping dredged spoil at the proposed disposal location.

The present proposal is to get the amendment to Environmental/CRZ Clearance for the extension of dredge spoil disposal dumping site from MoEF & CC. The detail of requirement for the extension of dumping ground is discussed in section 2 and the details of model studies are presented in section 3.

2 Need of Extended Dumping Ground

The need of the extended dumping ground is arrived by analysis the following aspects

2.1 Evaluation of Deposition Pattern for Pre and Post Dumping Scenario

The deposition pattern at the disposal ground was evaluated through series of bathymetric surveys. Four sets of (baseline and three post dumping survey) bathymetric surveys were carried out to evaluate the deposition pattern.

Figure 2-1 presents the baseline bathymetry, which shows parallel contours at the disposal ground and also presents the thickness of deposition at the disposal area after the intermediate bathymetry survey dated 11th July 2010. The quantity of deposition at the dumping area is computed to be 1.21 MCM. Figure 2-2 presents the thickness of deposition at the disposal area after the intermediate bathymetry survey dated 29th February 2011. The quantity of deposition at the dumping area is computed to be 1.87 MCM. The final

bathymetric survey at the dumping ground was carried out on 18th April 2011. The final quantity of the dredge spoil dumped at the disposal ground was computed to be 2.07 MCM.

The evaluation of the deposition pattern indicates the immediate settlement of dumped material without any movement of particles away from the disposal area.

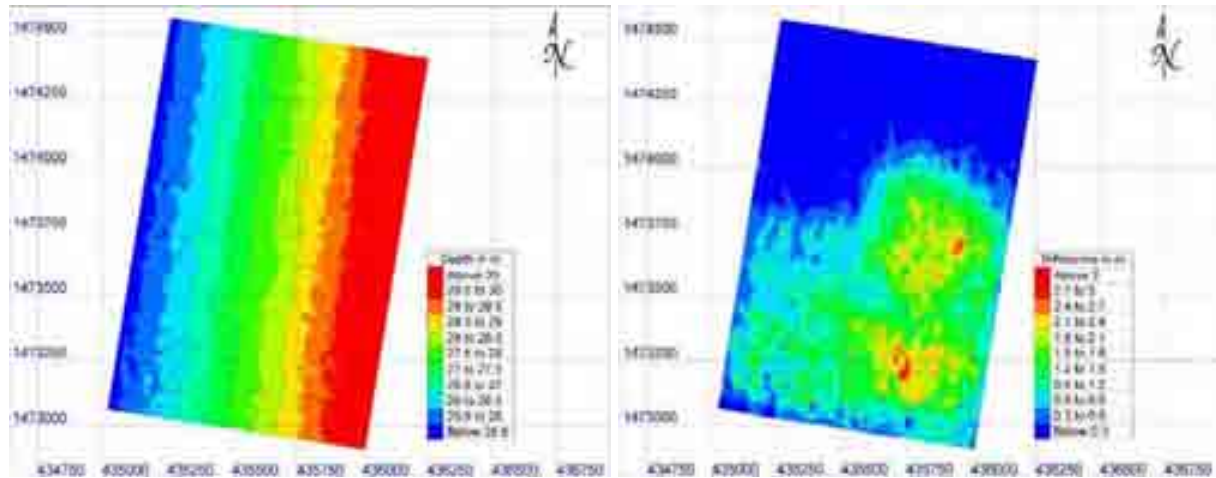


Figure 2-1: Bathy of Disposal Ground (DG) (2009) and Deposition Pattern at DG in July 2010

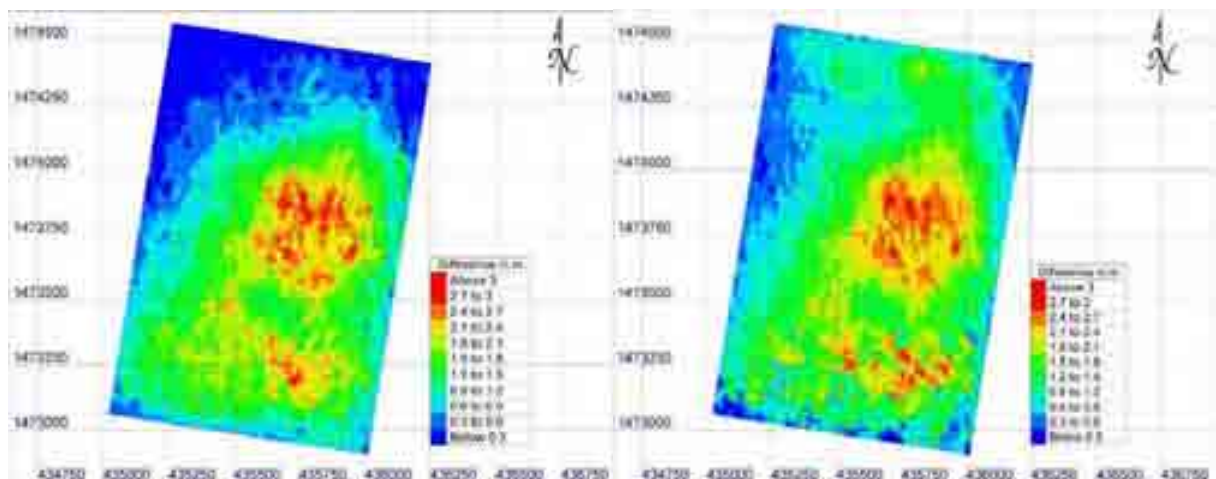


Figure 2-2: Deposition Pattern at DG in February 2011 and in April 2011

Based on the above analysis, it can be clearly observed that the average depth variations in the existing dumping site are in the range between 0.9-1.5 m. Further proposed future dumping at the existing dumping site will make the area further shallow and may hinder the movement of large size vessel's navigation in future phases of project if any. The existing dumping site was planned for small disposal quantities during initial phase of the project. Hence, it is suggested to extend dumping site (starts with Eastern Corner of existing dumping site) towards deeper water in order to maintain the natural depth with minimal variations though the dredger shuttle distance and cost of dredging increases.

Accordingly LTSB carried out the studies to identify the disposal location to accommodate present dumping requirements. Mathematical model study has been carried out to assess the fate of dredged spoil during dredging and dumping and its impact on the project area and near-shore regions.

The selection of the disposal site in sea depends on several factors, which can be broadly classified into environmental and economical considerations. The major economic factors are volume of dredged material and distance of the disposal site. The environmental

considerations are the characteristics of the material, short-term fate of the dredged material and the initial deposition pattern of the material in the bottom. These factors in turn determine the long-term movement of the disposed material from the disposal site. Generally, coarse material quickly settles to the bottom, while fine material is removed during its descent to the bottom and transported by currents to adjoining areas. The disposed material will settle down depending on its own bulk size and grain size with different settling velocity. Hence, the environmental conditions at the location of the disposal site should be such that it is not subjected to high near-bottom current velocities which would cause the disposed material to return to areas of interest like the approach channel. Moreover, the shuttle distance between the disposal site and the areas of dredging should not be too large, as this would increase cost of disposal and consequently the dredging cost. Hence, the selection of the disposal site has to be the result of a balance between the environmental factors and economy of cost. The dredge spoils will be disposed through a hopper or suitable dredger at the disposal site. The impacts due to disposal of dredged material such as the spreading of turbidity at disposal location, suspension and re-suspension of sediment in the bulk of water column, settlement on the bed after a certain residence time have been assessed by conducting detailed mathematical modelling studies.

The details are presented in the following sections.

3 Dredge Spoil Disposal Study - Mathematical Model Studies

3.1 Scope of studies

Detailed scope of work assigned by the client comprises of following

- To identify the new (extended) dredge spoil disposal Location to accommodate LTSB's future requirements.
- To carry out mathematical study considering different seasons to evaluate the impact of dredged spoil dumping in the identified extended disposal ground on the navigational channels and Harbour basin.
- To predict the post dumping sediment deposition pattern and sediment plume.

3.2 Methodology

The fate of dredge spoil dumped offshore depends on a number of parameters like prevailing ocean currents, wind and wave pattern, characteristics of dumped materials, dumping method and location etc. The seasonal variations, frequency of dumping, environmental conditions at the time of individual dumping, total dumped quantity, etc., affect the extent of sediment plume and depositional areas over a period of time. The variability of environmental conditions and sediment characteristics make the exact prediction of the deposition areas very difficult. Because of these reasons, it is essential to assess the environmental conditions like underlying hydrodynamics and wind patterns during different seasons, the likely sediment characteristics, and the general dumping pattern from the dredge log or from previous case studies. Keeping these points in mind, the following methodology was adopted for the present study.

- a) Bathymetry preparation for the model domain – Bathymetry is the primary input for setting up hydrodynamic model and affects the local hydrodynamics and the settling pattern of the dumped material. Bathymetry is prepared from the available survey data for the site and augmented with data from other secondary sources. The bathymetry at the

site has unique geomorphologic set-up in the form of Ennore and Pulicat shoals, which extend north south approximately parallel to the coast.

- b) Analysis of seasonal variations of environmental conditions – Since the dredging and dumping operations are going to be a long term process, it is essential to carry out the simulation for different environmental conditions representing various seasons. Since carrying out the simulation for a year is impractical, the environmental conditions will be schematised with combinations of typical current and wind pattern.
 - Current and Tide measurements – Current and tide measurement were carried out at site for a period of 15 days. This data is used for model set up and calibration. In addition, the observed current data with proper scaling has been used to simulate the hydrodynamics associated with different seasons.
 - Wind data – Wind data for the study area is obtained from the available literature and is analysed for seasonal variations. The profile of wind induced currents is different from the currents of other origin and plays an important role in the dispersion of suspended dredge materials and important in deciding the fate of dumped materials.
 - Seasons – Proper combinations of currents and winds is made for different seasons.
- c) Analysis of sediment characteristics –Fate of the dumped material largely depends on the characteristics of sediments. The available data on the sediment grain-size distribution is analysed to arrive at representative values for the study area.
- d) Dredging and dumping characteristics – The hopper load, bulk density, dumping duration, dumping frequency, etc. are required to simulate the long term behaviour of the dredge spoil dumping. These data is obtained from the actual dredging operations carried out as a part of LTSB's initial phase development.
- e) Model set-up and calibration (Hydrodynamic flow model) – Hydrodynamic flow model set up and calibration was carried out with the available data. Once the model is calibrated, different scenarios is simulated corresponding to different flow conditions. This provides the hydrodynamic basis for running particle transport model.
- f) Model set-up (Particle Analysis) - PA module of Mike21 suite of software set up with the hydrodynamic flow model results, dredging parameters, sediment characteristics and appropriate wind conditions. PA module simulates the fate of the dumped materials and provides the plume concentrations and deposition patterns of the dumped materials.
- g) Interpretation of the simulated results

3.3 Model Inputs

3.3.1 Bathymetry

The bathymetry of the study area is reconstructed by digitising the Naval Hydrographic Office (NHO) chart No.s 313 and 3028, blended with ETOPO - I data and site specific bathymetry survey by M/s Indomer Coastal Hydraulics (P) Limited, Chennai (INDOMER). Other bathymetric features like dredge channels and breakwaters were obtained from the DPR for the development of Shipyard cum Port complex at Kattupalli.

The general bathymetry of the study area has been prepared with a grid resolution of 50m so that the shoals and other features like dredged channels can be reproduced with a reasonable resolution without compromising on the simulation time, covering an area of 20x25 km and extending beyond 80m contour off the coast. The coastline of the study

stretch is oriented from N-S (SSE) with +/- 10 degree skew. The digital bathymetry of the model domain is presented in Figure 3-1.

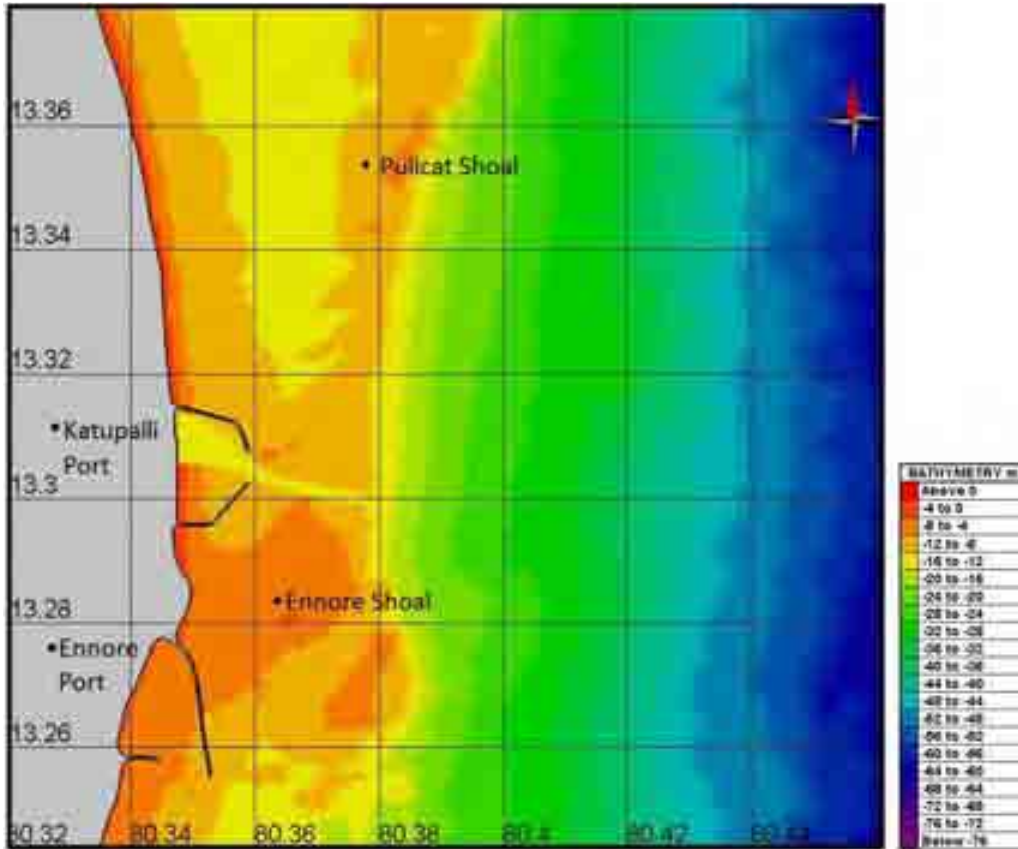


Figure 3-1 Bathymetry (with respect to MSL) of the model domain

3.3.2 Tide

Tide measurement at the site was carried out for 15 days duration by INDOMER. The measured tide show maximum spring tide range of 0.85m and neap tide range of 0.3m. The reference tide level in the study stretch is as follows

Mean high water spring	-	1.1m
Mean high water neap	-	0.8m
Mean low water neap	-	0.4m
Mean low water spring	-	0.1m
Mean sea level	-	0.6m

The measured tide variation at site is presented in Figure 3-2

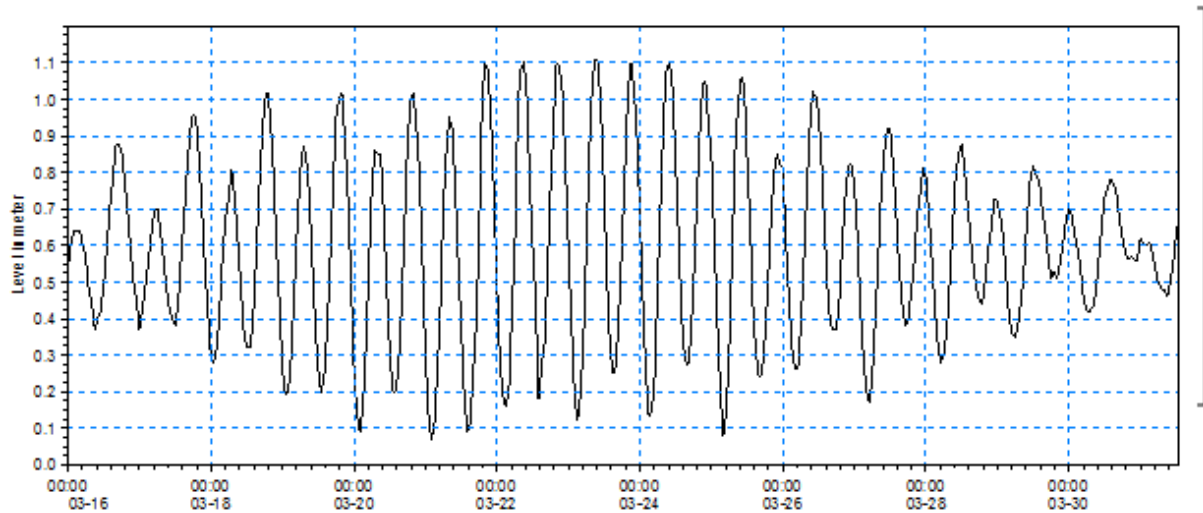


Figure 3-2 Measured tide (w.r.t CD) at Kattupalli

3.3.3 Current

Current measurement has been carried out by INDOMER at the site for 15 days at a water depth of 9m. The current rose obtained from the measured current at the site is presented in Figure 3-3. Predominant direction of current flow during the period of observation is towards north. The maximum current speed recorded during the observation period is about 0.3m/s. The observed current shows very weak tidal currents superposed on comparatively stronger currents of monsoonal origin.

The current pattern at the study stretch is mainly influenced by the general monsoon climate. Strength of tidal current along the coast is weak and does not influence the current direction in general. The general current direction at site is northerly during May to September (SW Monsoon) and southerly during October to January (NE Monsoon). Current speeds during transitional periods (February to April) are low and direction varies between northerly and southerly. The available literature/publications (NHO chart no 313) based on measurements in the study stretch indicate that the current speed can reach up to 0.5m/s.

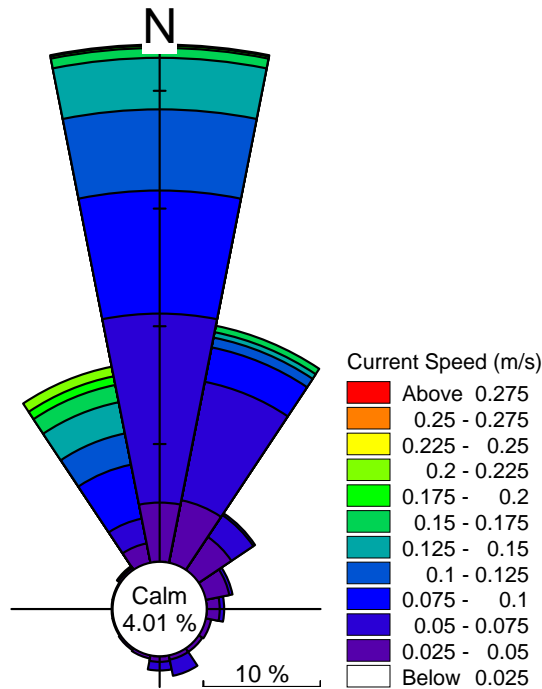


Figure 3-3 Current rose for the month of March

3.3.4 Wind

Apart from other effects, wind driven circulation also plays a role in the dispersion of the dumped dredge spoil. The wind pattern of the study area is taken from the Climatology Table published by Indian Meteorological Department (IMD). The average monthly variation of wind speed considered in the study is tabulated in Table 3-1.

3.3.5 Seasons

Based on the observations and published data, monthly mean environmental states were prepared as shown in Table 3-1. It is obvious from the table that there exists certain combinations of current and wind conditions and that can be used in the preparation of simulation scenarios.

Table 3-1 Monthly mean environmental states (Climatological Table, IMD)

Month	Current		Monthly mean wind characteristics			Wind Scenario
	Direction	Speed (m/s)	Direction		Speed (m/s)	
			0830	1730		
January	South	0.2 – 0.5	N-NE	N-NE	4	Scenario – I
February	North /South	Low	W-SW	SE-S	4	Scenario - II
March	North	Low	W-SW	SE-S	4	Scenario - II

	/South					
April	North /South	Low	W-SW	SE-S	6	Scenario - III
May	North	0.2 – 0.5	W-SW	SE-S	6	Scenario - III
June	North	0.2 – 0.5	W-SW	SE-S	6	Scenario - III
July	North	0.2 – 0.5	W-SW	SE-S	6	Scenario - III
August	North	0.2 – 0.5	W-SW	SE-S	6	Scenario - III
September	North	0.2 – 0.5	W-SW	SE-S	4	Scenario - II
October	South	0.2 – 0.5	W-SW	SE-S	4	Scenario - II
November	South	0.2 – 0.5	N-NE	N-NE	4	Scenario – I
December	South	0.2 – 0.5	N-NE	N-NE	4	Scenario – I

3.3.6 Sediment grain size distribution

Since the dredged materials come from the subsurface region, the grain size distributions should preferably be adopted from a subsoil sample. A better idea can be obtained if the samples from the hopper are analysed. Grain size distribution over the study area has been collected from the available bore logs, DBH-1, MBH-102, ABH-2, MBH-104, DBH-6, DBH-4, NBW-1, DBH-2, MBH-3, SBW-416, NBW-31, DBH-501, etc. which falls on the dredging area. The locations of the bore holes in the dredging zone are presented in Figure 3-4. Grain size distribution graph for a typical bore log is presented in Figure 3-5

From the analysis of the bore log data, it is noticed that the predominant portion of the sediment sample is composed of fine sand, except for a few pockets of silty-clay near the proposed harbour entrance (ABH-2). The grain size distributions of sediment sample from the dredger show similar grain size distribution with very low percentages for grains finer than 0.075mm. This could be due to the loss of finer materials during the dredging operations and hopper overflows.

Two types of representative grain size distribution, which represent the dominant grain size distributions at the site were derived from the available bore log data. Type-I sediment has grain size distribution composed of fine sand with small fraction of silt content which is presented in Figure 3-6. This is the predominantly occurring sediment type in the dredging area and matches with the sediment size distribution of samples from the dredger hopper. Type -II sediment has significantly more silt and clay content. Sediments of this type are present in small isolated pockets and can spread over a larger area when the dredge spoil is dumped at the disposal site. The grain size distribution of Type-II sediment is presented in Figure 3-7. Though Type – II sediments are rare in the study area; this has been included in the study to simulate the possible extremes of plume spreading.

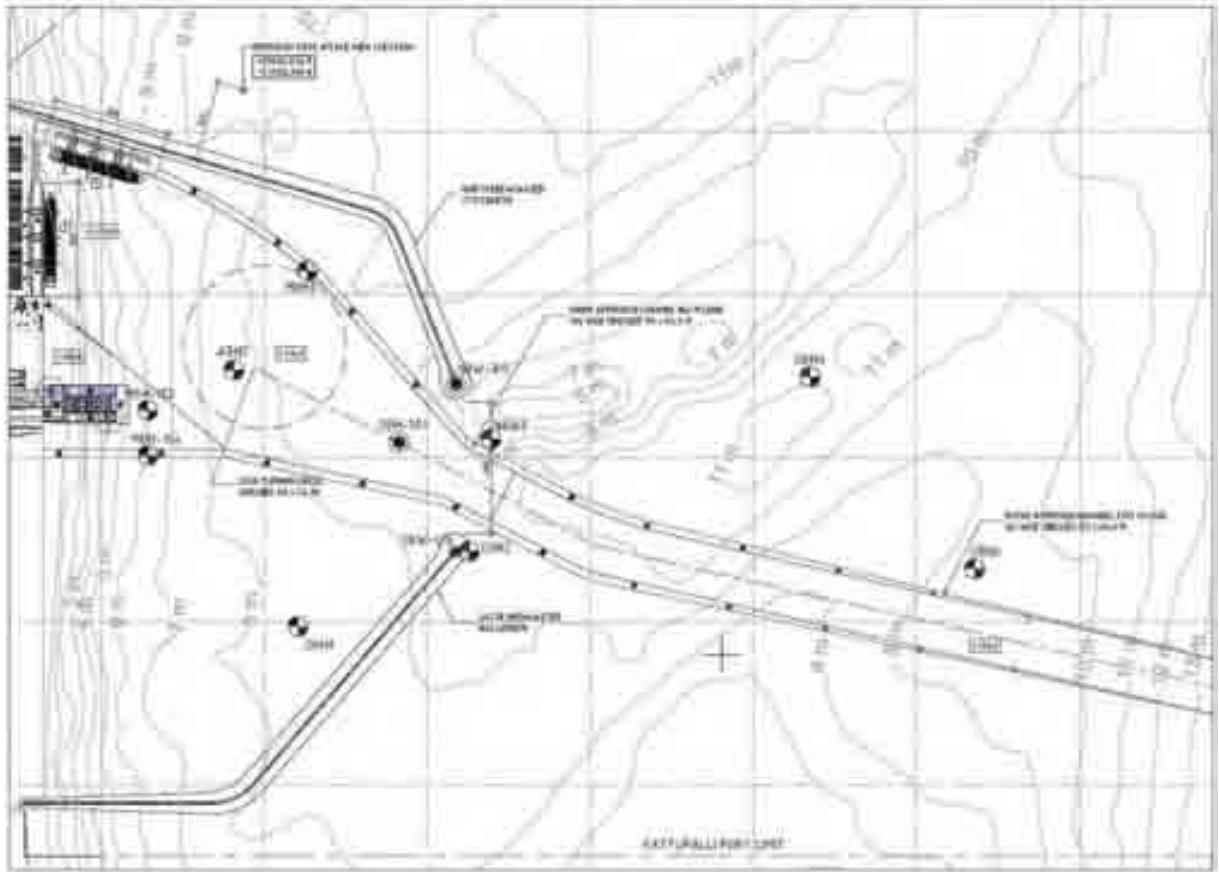


Figure 3-4 Bore log locations in the dredging zone

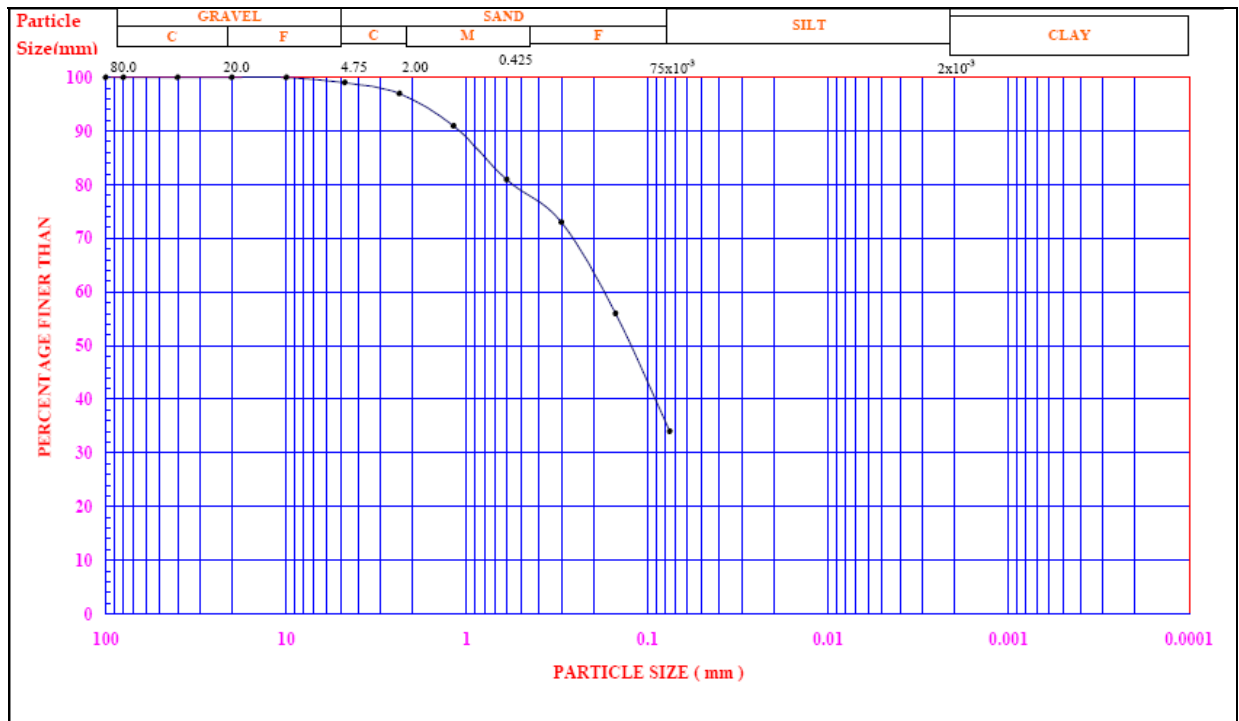


Figure 3-5 Grain size distribution graph for ABH – 2

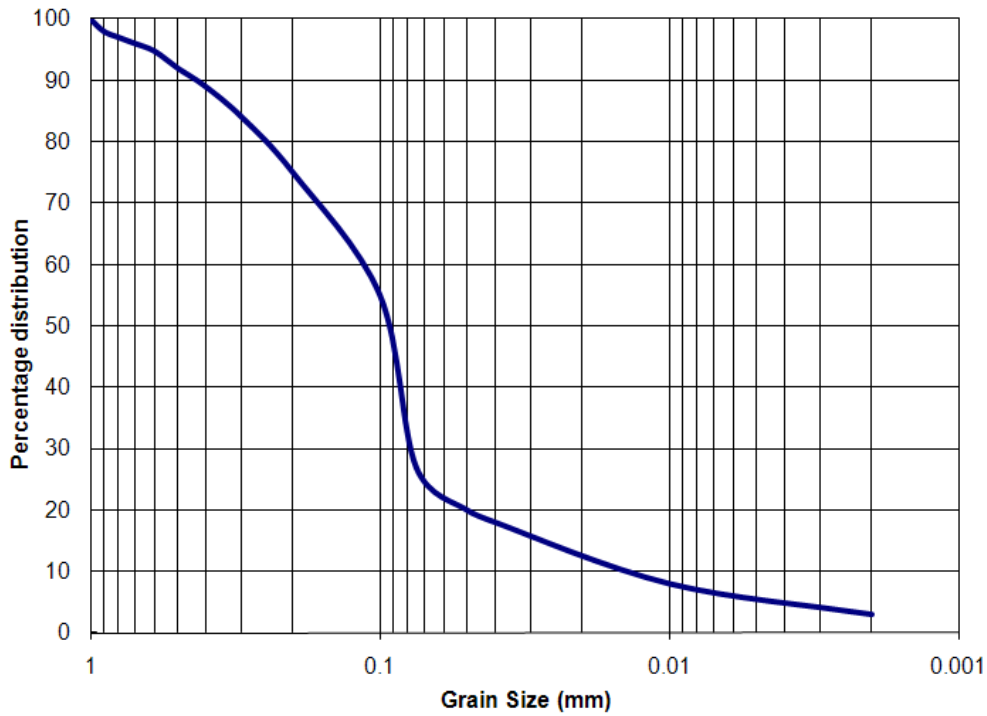


Figure 3-6 Grain size distribution of Type-I sediment

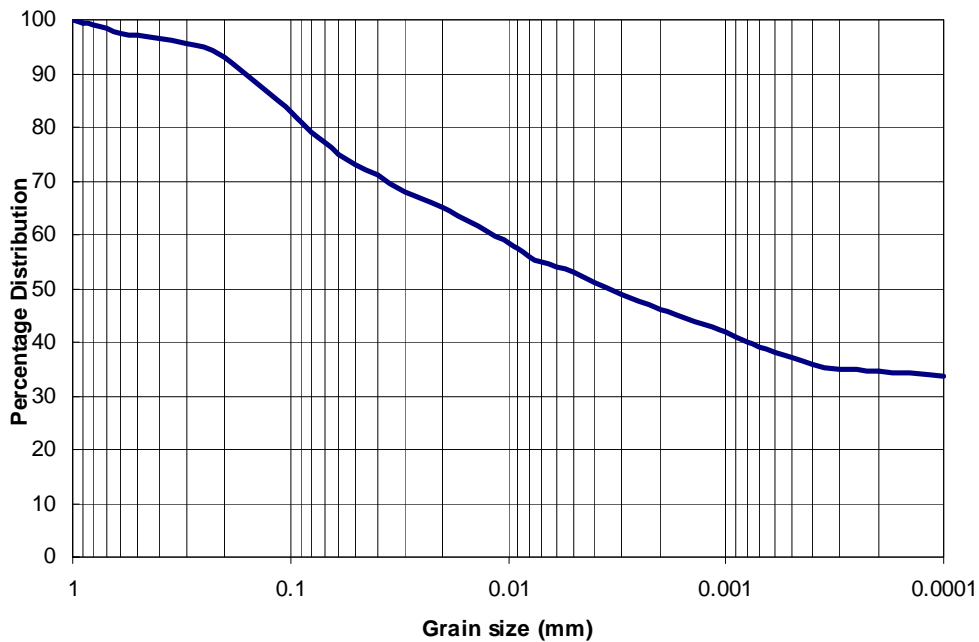


Figure 3-7 Grain size distribution of Type –II sediment

3.3.7 Dredging parameters

The total amount of dredging for deepening of harbour at Kattupalli port is estimated to be about 16 Mm³ out of which, 2.5 Mm³ will be dumped by mid 2015, and another 2.5 Mm³ by 2016- 2017, remaining quantities may be dumped in a phased manner based on the growth in business scenario within Five years. For the present study 5 Mm³ has been considered and for the same dumping ground has been identified.

Following dredging parameters for Kattupalli were considered for the model study after discussions with the client. The dumping sequence is planned such that the dumping is

uniformly distributed over the entire dumping area. The data regarding dredgers and disposal parameter used in this study is based on a similar dredging operation carried out during the initial phase dredging and dumping operations at LTSPB.

- Hopper volume = 10000m³
- Percentage of solids in the hopper = 70
- Bulk density = 1600kg/m³
- Dumping duration = 5 minutes
- Average dumping rate = 37333kg/s
- Number of dumping per day = 8
- Interval between successive dumping = 3.0hrs
- Maximum height of dumped material = 0.3m
- Number of days required for completion of disposal operation = 90days

3.3.8 Identification of dumping ground for spoil disposal

Keeping environmental conditions as main criteria, dumping locations has been identified which is shown in Figure 3-8.

The selection of dumping ground also depends on dredging quantity, water depth and the current flow pattern. The identified disposal ground is located about 5.9km from the north breakwater in water depth beyond 29m with a spatial extent of 4.2kmX4.2km. The co-ordinates (WGS-84) of the selected dumping ground are presented in the following table.

A	13° 19' 0.17"N	80° 26' 50.71"E
B	13° 19' 22.04"N	80° 24' 32.90"E
C	13° 21' 37.00"N	80° 24' 55.22"E
D	13° 21' 15.13"N	80° 27' 13.05"E

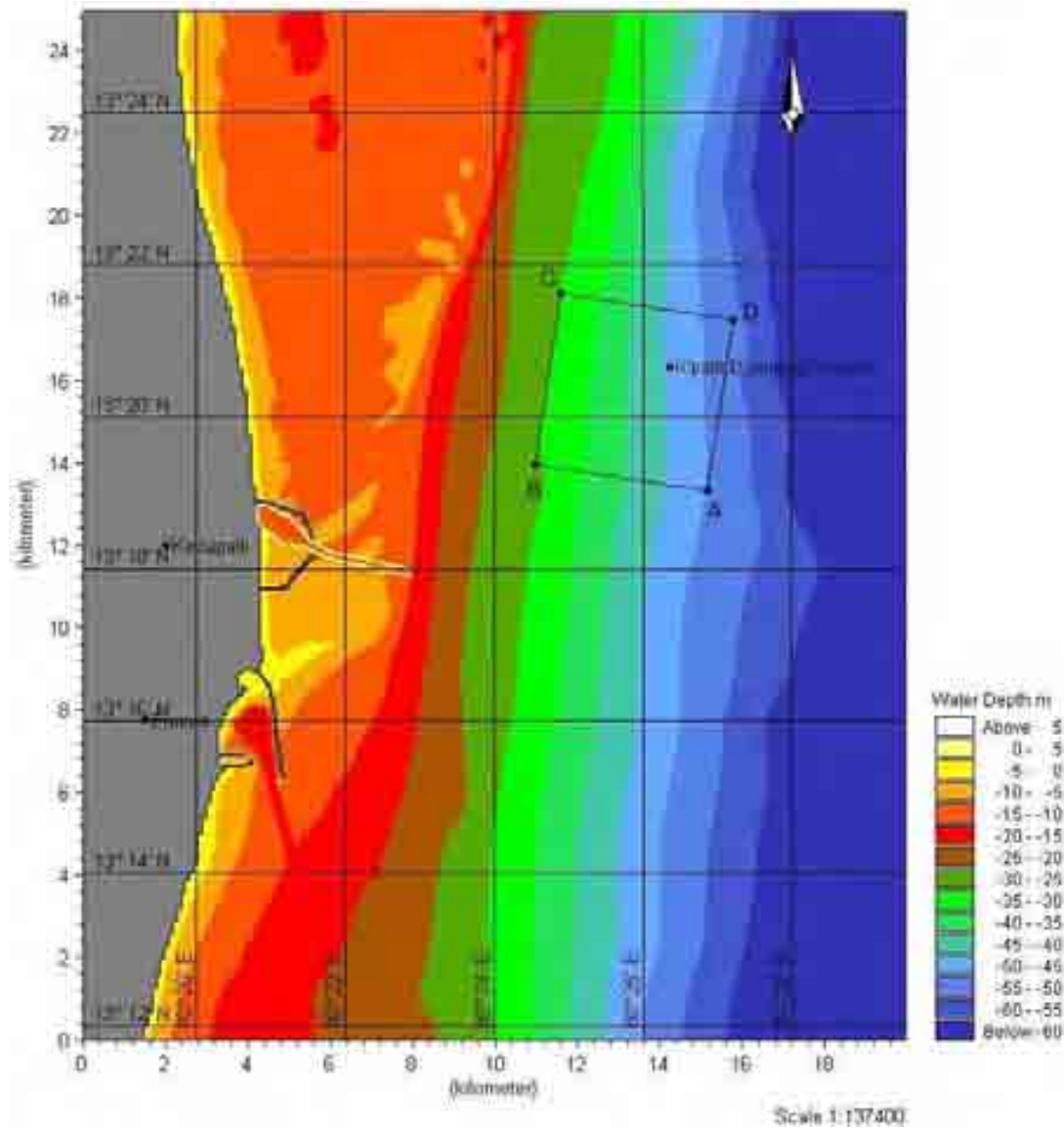


Figure 3-8: Designated dumping ground of Kattupalli Port

3.4 Hydrodynamic flow model

Particle tracking module requires information about the current field to estimate the movement of dumped materials. In order to establish the local circulation pattern, a site-specific hydrodynamic model was set up using HD model of Mike-21.

The HD module is the basic module in the MIKE 21 suite of software, which provides the hydrodynamic basis for the computations of all other modules like sediment transport, particle tracking, etc. The HD module simulates water level variations and flows in response to a variety of forcing functions like wind tides and waves. The model can include the effect of the bottom shear stress, wind shear stress, Coriolis force, momentum dispersion, sources and sinks and wave radiation stresses. Based on the study requirement the parameters have been introduced in to the model.

The governing equations for the coastal circulation are the two-dimensional shallow water equations. These are obtained by vertically integrating the three- dimensional Navier Stoke's equations of motion making the following assumptions,

- The flow is incompressible

- The flow is well mixed
- Vertical acceleration is negligible

Simulation of hydrodynamics is based on these non-linear vertically integrated 2-D equations of conservation of mass and momentum.

$$\frac{\partial \zeta}{\partial t} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = \frac{\partial d}{\partial t}$$

$$\frac{\partial p}{\partial t} + \frac{\partial}{\partial x} \left(\frac{p^2}{h} \right) + \frac{\partial}{\partial y} \left(\frac{pq}{h} \right) + gh \frac{\partial \zeta}{\partial x} + \frac{gp\sqrt{p^2 + q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w} \left[\frac{\partial}{\partial x} (h\tau_{xx}) + \frac{\partial}{\partial y} (h\tau_{xy}) \right] - \Omega q - fVV_x + \frac{h}{\rho_w} \frac{\partial}{\partial x} (p_a) = 0$$

$$\frac{\partial q}{\partial t} + \frac{\partial}{\partial y} \left(\frac{q^2}{h} \right) + \frac{\partial}{\partial x} \left(\frac{pq}{h} \right) + gh \frac{\partial \zeta}{\partial y} + \frac{gq\sqrt{p^2 + q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w} \left[\frac{\partial}{\partial y} (h\tau_{yy}) + \frac{\partial}{\partial x} (h\tau_{xy}) \right] + \Omega p - fVV_y + \frac{h}{\rho_w} \frac{\partial}{\partial y} (p_a) = 0$$

The following symbols are used in the equations:

$h(x,y,t)$	water depth (= $\zeta-d$, m)
$d(x,y,t)$	time varying water depth (m)
$\zeta(x,y,t)$	surface elevation (m)
$p,q(x,y,t)$	flux densities in x- and y- directions ($m^3/s/m$) = (uh,vh); (u,v) = depth averaged velocities in x- and y- directions.
$C(x,y)$	Chezy resistance ($m^{1/2}/s$)
g	acceleration due to gravity (m/s^2)
$f(V)$	wind friction factor
$V, V_x, V_y(x,y,t)$	wind speed and components in x- and y- direction (m/s)
$\Omega(x,y)$	Coriolis parameter, latitude dependent (s^{-1})
$p_a(x,y,t)$	atmospheric pressure ($kg/m/s^2$)
ρ_w	density of water (kg/m^3)
x,y	space co-ordinates(m)
t	time(s)
T_{xx}, T_{xy}, T_{yy}	components of effective shear stress

Hydrodynamic circulation pattern of the study area was set up with existing condition and the calibration of the model done with the available measured data. Observed values of tide and currents were used to set up the boundary conditions. Since high variance is observed on the observed data, a low pass filtering was applied to the observed currents and water levels. Appropriate values were used for model parameters like, eddy viscosity, bottom friction, time step, etc., to get a stable solution. Model bathymetry was prepared with 50m grid spacing covering an area of 20 x 25km.

The simulated current speed from the model is compared with the observed current as shown in Figure 3-9 which indicates a good agreement between the observed and the simulated current, and therefore the model is considered as calibrated. The simulated flow pattern in the green-field condition is presented in Figure 3-10.

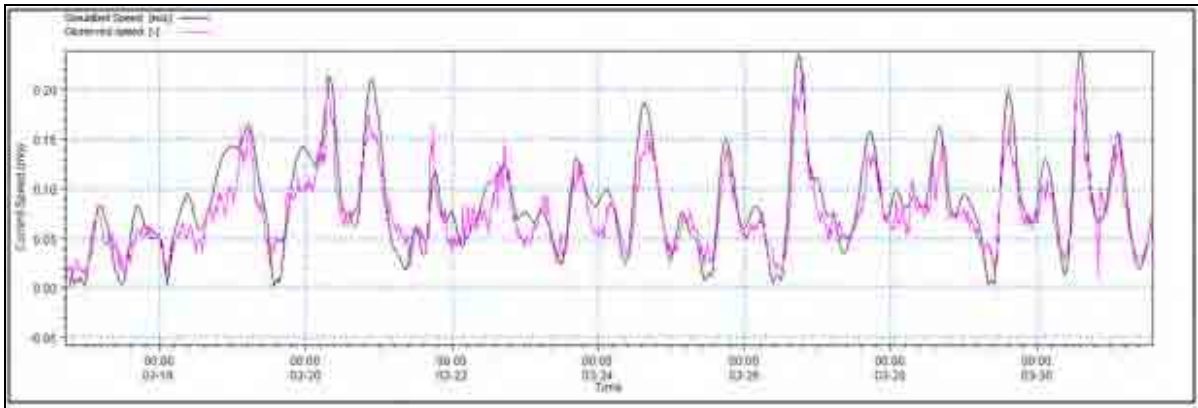


Figure 3-9: Comparison between simulated and observed current

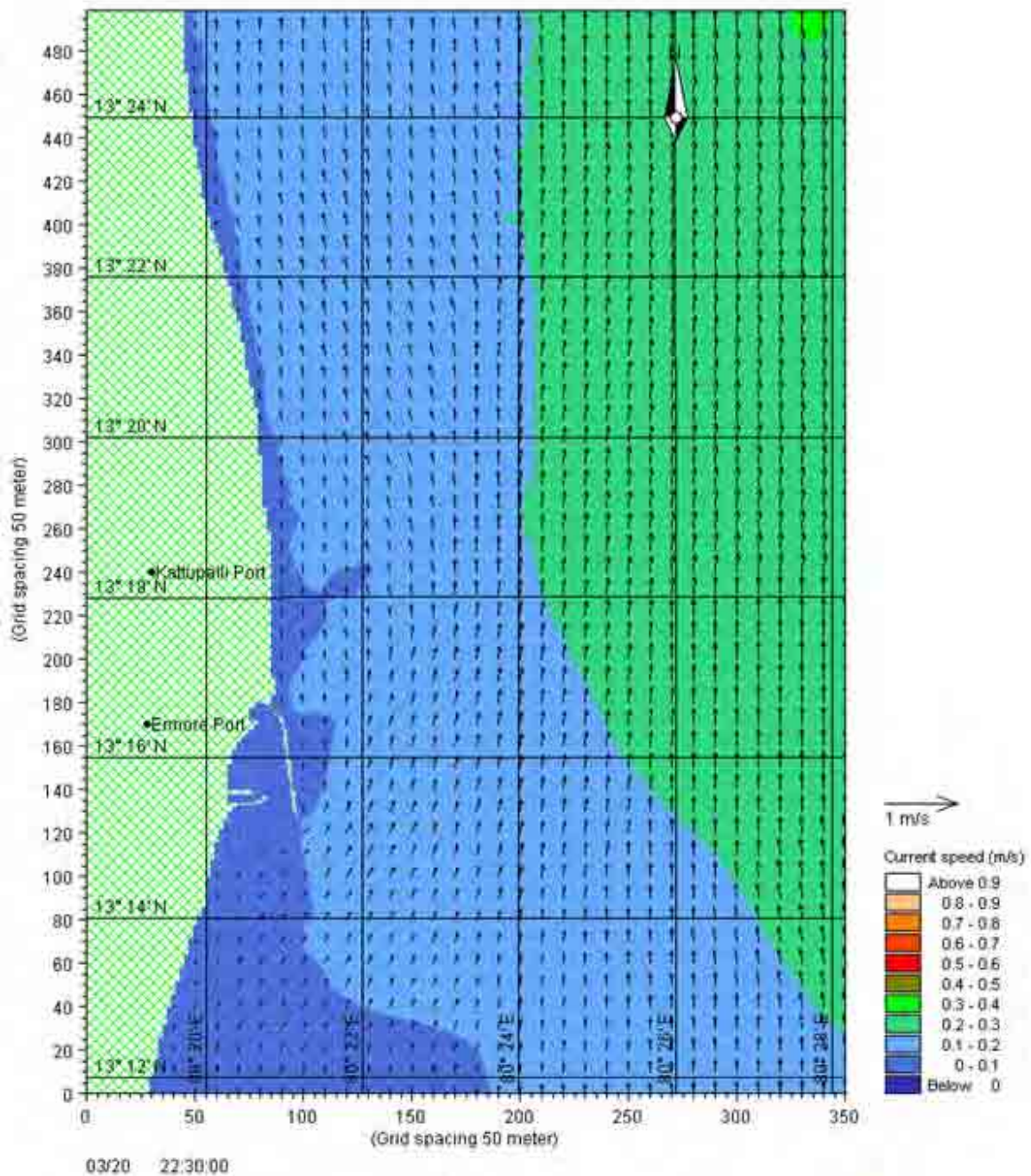


Figure 3-10: Flow pattern in the study domain for Greenfield condition

In order to simulate the dredge spoil dumping operation, it is essential to simulate the hydrodynamic conditions for each season, since it was estimated that the duration of dumping may span over one year. However, the physical oceanographic observations cover only 15 days in March, which is not representative of all seasons, and therefore the data was scaled appropriately to represent other seasons too. Three sets of current speeds were considered to cover all possible hydrodynamic conditions throughout the year with two current directions, namely northerly and southerly, for each set of current speeds. These scenarios were obtained by scaling the observed current by 25%, 100% and 200% and by reversing the flow direction to represent southerly flows. These scenarios correspond to the calm environment during transitional period, and 0.25m/s and 0.5m/s current speeds that occur during other periods. The observed current data was subjected to harmonic analysis and tidal and non-tidal components of the currents were separated. The scaling was achieved by modifying the non-tidal components of the current and then merging it with the original tidal currents.

A set of 6 hydrodynamic simulations with the calibrated model were carried out and are named as follows for convenience.

- Scenario – I N : Hydrodynamic flow with observed current, Northerly flow
- Scenario – I S : Hydrodynamic flow with observed current, Southerly flow
- Scenario – II N : Hydrodynamic flow with strong current (200% of the observed current, Northerly flow)
- Scenario – II S : Hydrodynamic flow with strong current (200% of the observed current, Southerly flow)
- Scenario – III N : Hydrodynamic flow with weak current (25% of the observed current, Northerly flow)
- Scenario – III S : Hydrodynamic flow with weak current (25% of the observed current, Southerly flow)

3.4.1 Simulated Results

The hydrodynamic simulations were carried out for all the 6 hydrodynamic conditions. Comparison of the results from these simulations shows that the simulated flow patterns at the dumping grounds is not affected significantly by the port development. However, the flow pattern gets modified in the near vicinity of the port due to the construction of breakwaters (Figure 3-11). Since the change in flow pattern is negligible near the dumping ground, which is the area of interest, the hydrodynamic scenarios considered with LTSB's layout for dredged spoil study and are discussed here as follows.

3.4.1.1 Scenario – I N & S

Current vectors depicting the typical flow patterns in the model area for the observed current speed are presented in the Figure 3-11 & Figure 3-12. The maximum current speeds simulated at Kattupalli dumping grounds for northerly flow is 0.235 m/s. Similarly maximum current speeds simulated at the Kattupalli dumping ground for southerly flow is 0.209 m/s.

3.4.1.2 Scenario – II N & S

Current vectors depicting the typical flow pattern in the model area is presented in the Figure 3-13 & Figure 3-14. The maximum current speeds simulated at Kattupalli dumping ground for northerly flow is 0.459 m/s. Similarly maximum current speeds simulated at the Kattupalli dumping ground for southerly flow is 0.410m/s.

3.4.1.3 Scenario – III N&S

Current vectors depicting the typical flow pattern in the model area is presented in the Figure 3-15 & Figure 3-16. The maximum current speed simulated at Kattupalli dumping ground for northerly flow is 0.105 m/s. Similarly maximum current speed simulated at the Kattupalli dumping ground for southerly flow is 0.103m/s.

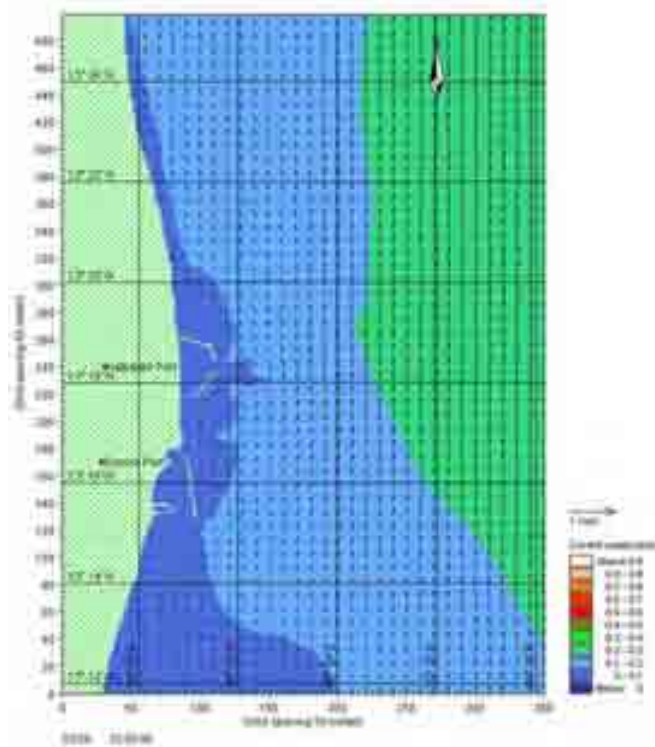


Figure 3-11: Flow pattern with observed current (N)

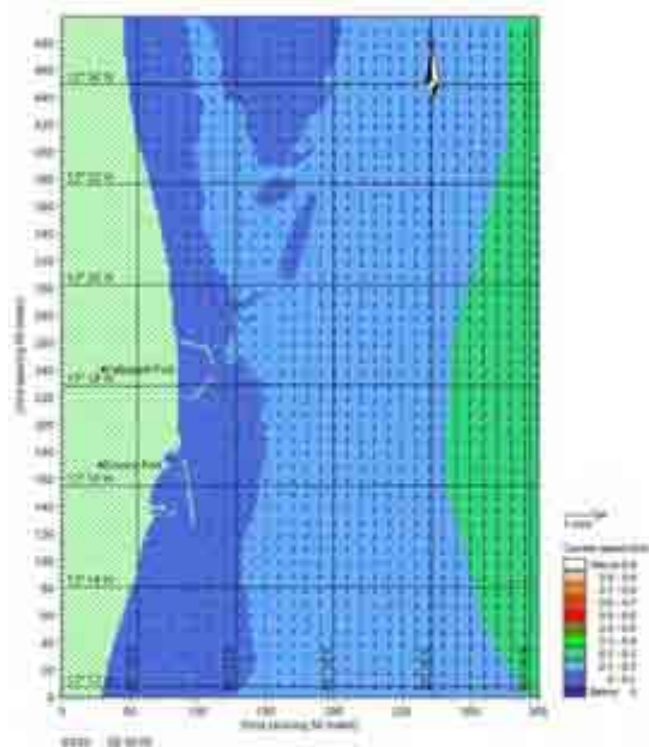


Figure 3-12: Flow pattern with observed current (S)

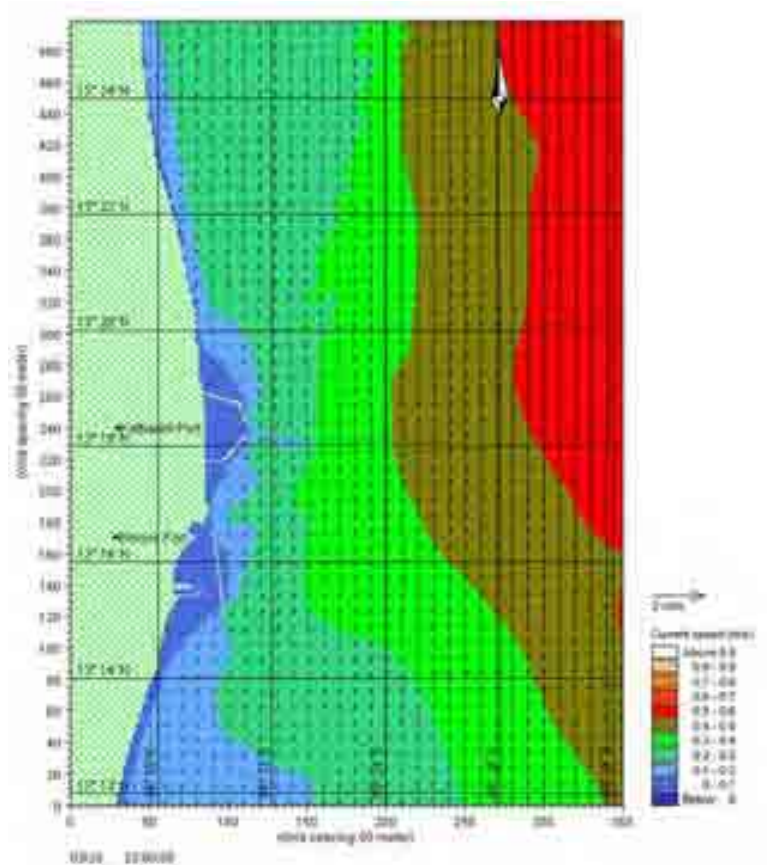


Figure 3-13: Flow pattern with Strong current (N)

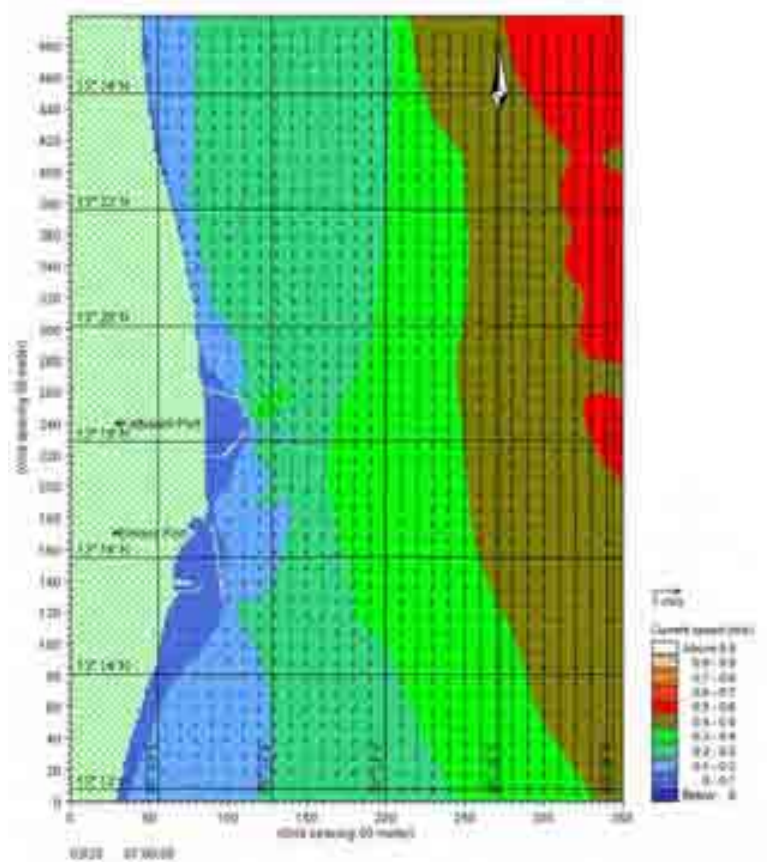


Figure 3-14: Flow pattern with Strong current (S)

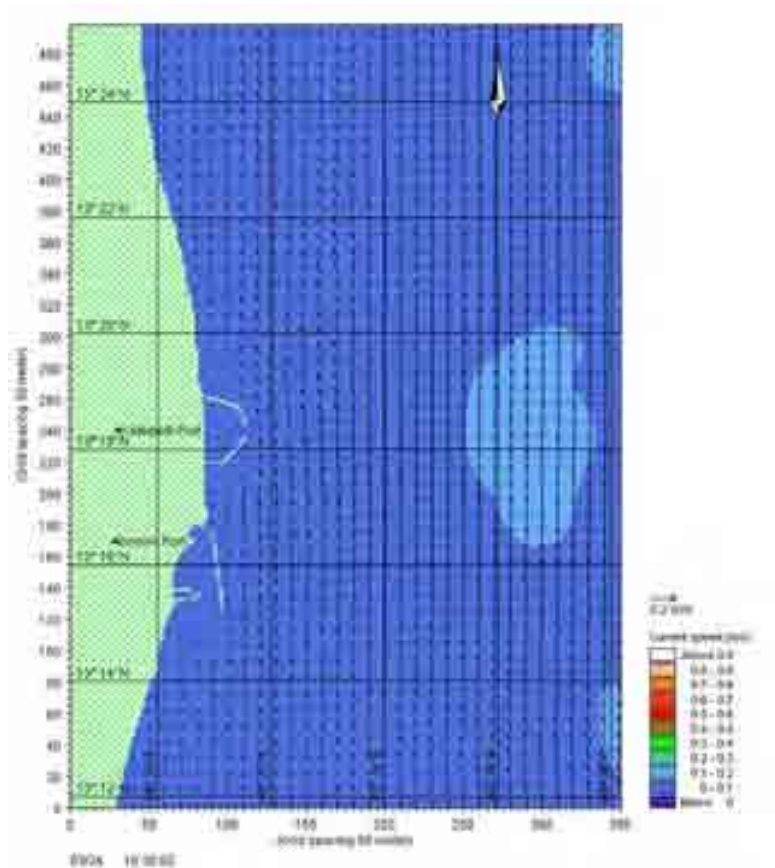


Figure 3-15: Flow pattern with weak current (N)

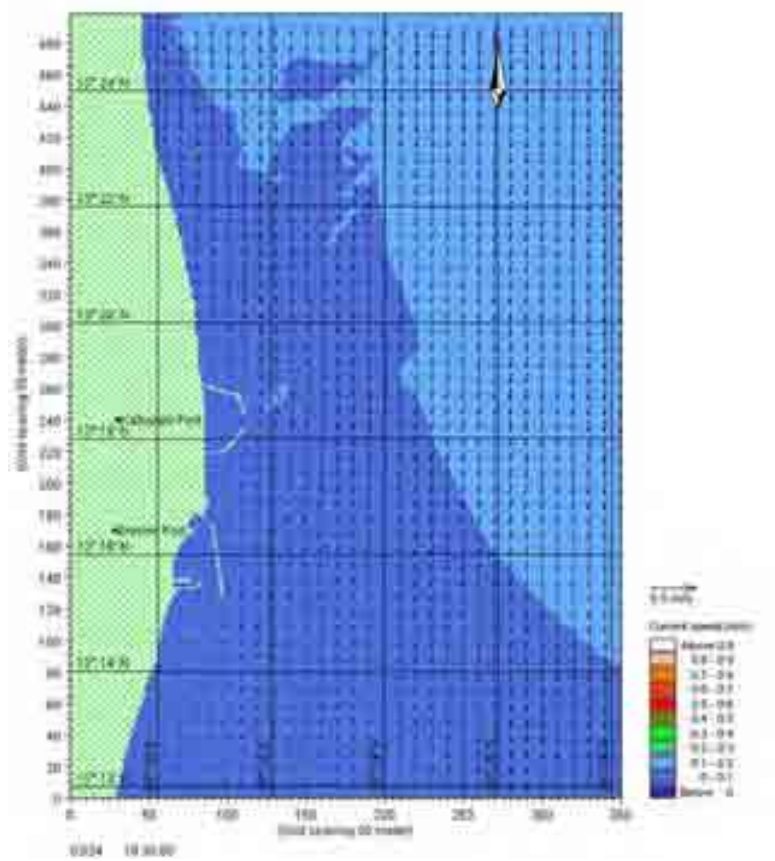


Figure 3-16: Flow pattern with weak current (S)

3.5 Particle Analysis Model

The Particle Analysis (PA) module of Mike21 suite is used to simulate the transport and dispersion of dredge spoil in the open sea. The particle flow in PA analysis is divided into Lagrangian discrete parcels representing a large ensemble of small packets. The movement of each particle is influenced by the physical/chemical processes of the coastal flow. Once the particle is released in the water body, their discrete path and mass are followed and recorded as function of time relative to the reference grid system fixed in the space. The Lagrangian discrete parcel scheme calculates the displacement of each particle as the sum of an advective deterministic component and an independent, random Markovian component, which statistically approximates the random chaotic nature of time averaged tidal mixing.

The model requires information about the underlying hydrodynamics and wind apart from the sediment characteristics to simulate the flow of particles. The results of hydrodynamic simulations along with the seasonal wind were used to track the dredge spoil dumped in the designated coastal environment. The average monthly environmental conditions prevalent in the area are shown in Table 3-1. It is obvious from this table that certain combinations of wind and current patterns can be obtained which are representative of different seasons. As discussed in the earlier section, two types of sediments were considered for simulating the particle movement. Based on these combinations, a run matrix for PA was made as shown in Table 3-2. The location of dumping was varied within in the dumping ground for each dumping operation to get a realistic simulation.

Table 3-2 Run matrix for Particle Analysis (PA)

Run No	HD Scenario	Wind Scenario	Dumping Site	Sediment Type	Representative months
1	Scenario – II N	Scenario – III	Kattupalli	Type – I	May – August
2	Scenario – II N	Scenario – II	Kattupalli	Type – I	September
3	Scenario – I S	Scenario – II	Kattupalli	Type - I	October
4	Scenario – II S	Scenario – II	Kattupalli	Type - I	October
5	Scenario – II S	Scenario – I	Kattupalli	Type - I	November, December, January
6	Scenario – I S	Scenario – I	Kattupalli	Type - I	November, December, January
7	Scenario – I N	Scenario – III	Kattupalli	Type - II	May – August
8	Scenario – II N	Scenario – III	Kattupalli	Type – II	May – August
9	Scenario – II N	Scenario – II	Kattupalli	Type – II	September
10	Scenario – I N	Scenario – II	Kattupalli	Type – II	September
11	Scenario – II S	Scenario – II	Kattupalli	Type – II	October

Run No	HD Scenario	Wind Scenario	Dumping Site	Sediment Type	Representative months
12	Scenario – I S	Scenario – II	Kattupalli	Type – II	October
13	Scenario – II S	Scenario – I	Kattupalli	Type - II	November, December, January
14	Scenario – I S	Scenario – I	Kattupalli	Type - II	November, December, January
15	Scenario – III S	Scenario – III	Kattupalli	Type – II	February to April

3.5.1 Simulated Results

Simulation studies for dredge spoil disposal were carried out with various parameters as shown in Table 5-1. Simulations were carried out for a period of 30 days for each of these scenarios. The simulation results can be combined with proper weightages applied to different runs and extrapolated to obtain the final deposition pattern. Figures of deposition patterns at the end of each simulation are shown in Figure 3-17 to Figure 3-28. Typical plot of average concentrations is shown in Figure 3-29 and Figure 3-30 is immediately after dumping and after one hour respectively. Similarly, typical average concentration patterns for other scenarios immediately after dumping are shown in Figure 3-31 to Figure 3-39.

It is inferred from the simulated scenario that the spreading of dredge spoil is driven only by the prevailing current rather than any other environmental scenario (such as wind and wave). Effect of wind is noticeable only on fine sediments and at lower current speeds. This can be seen from the deposition pattern of the dumped dredged spoil which is oriented north south.

Even though larger spreading of the dredge spoil is noticed with finer (Type II) sediment, they settle in deeper water without being carried towards the navigation channel of Kattupalli Port. Percentage of occurrence of such fine sediments is low. If the dumping is being carried out during May to September, the plume will travel towards north and deposition will occur towards north of the dumping site. The findings of particle tracking simulations are detailed in the following sections.

3.5.1.1 Kattupalli dumping site, Coarse (Type- I) sediment

It is observed that the material of Type –1 with less percentage of fines tend to settle in the immediate vicinity of the dumping ground even for strong currents. Strong currents can cause depositions beyond a distance of 1.5 to 2km away from the dumping site occasionally. The depositional trend is along the 29-60m contour and the sediments do not spread towards the shore. Higher average sediment concentrations have been observed immediately after each dumping operation, which comes down to ambient values within one hour. Typical averaged sediment concentration in water column one hour after dumping is presented in Figure 3-30 which shows the values are negligible. The average concentration of the sediment plume is found to be travelling parallel to the coast and reaching up to 4km away from the dumping site occasionally. The effect of wind on the spreading is found negligible under strong currents.

When the current speeds are lower (HD Scenario-I), the materials settles locally without any significant spreading (Figure 3-19). Average thickness of the deposited material is found to

be less than 0.3m after 30days of dumping within the dumping ground. Sediment plume was confined to the area of dumping for observed currents.

The coarse material (Type-I sediment) disposed on the dumping ground is found to have negligible effect on Kattupalli port.

3.5.1.2 Kattupalli dumping site, Finer (Type- II) sediment

Type –II sediments, which contain more fines, tend to spread over a larger area. Occasional strong currents carry the material farther to a distance of 4 to 8km away from the dumping site. Because of the larger spread, the thickness of deposited material is found to be low. Influence of wind is noticeable in this case. Pulicat shoals prevent the sediments from reaching the shore during northerly flows. Typical averaged sediment concentrations in water column 1.5 and 2.5 hours after dumping are presented in Figure 3-34 & Figure 3-35 respectively. It is observed that the sediments settle within 2 to 3 hours from the time of dumping and sediment concentrations falls back to the ambient values.

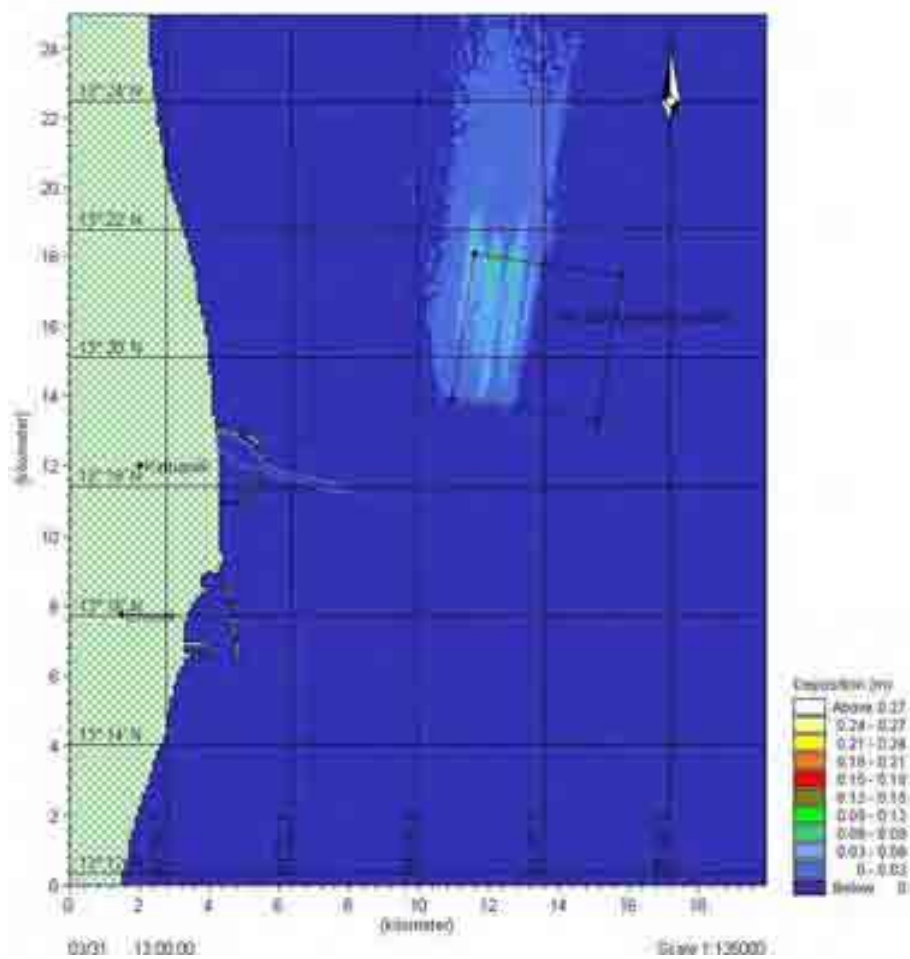


Figure 3-17: Deposition pattern for PA Run # 1 (strong currents (N); coarse sediments; Kattupalli dumping during May – August)

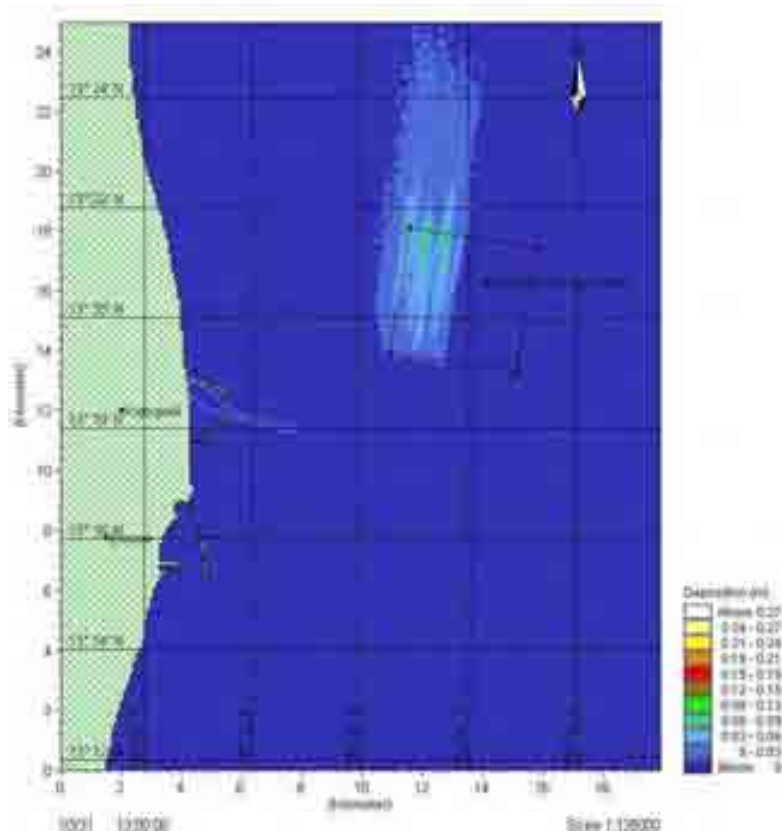


Figure 3-18: Deposition pattern for PA Run # 2 (strong currents (N); coarse sediments; Kattupalli dumping during September)

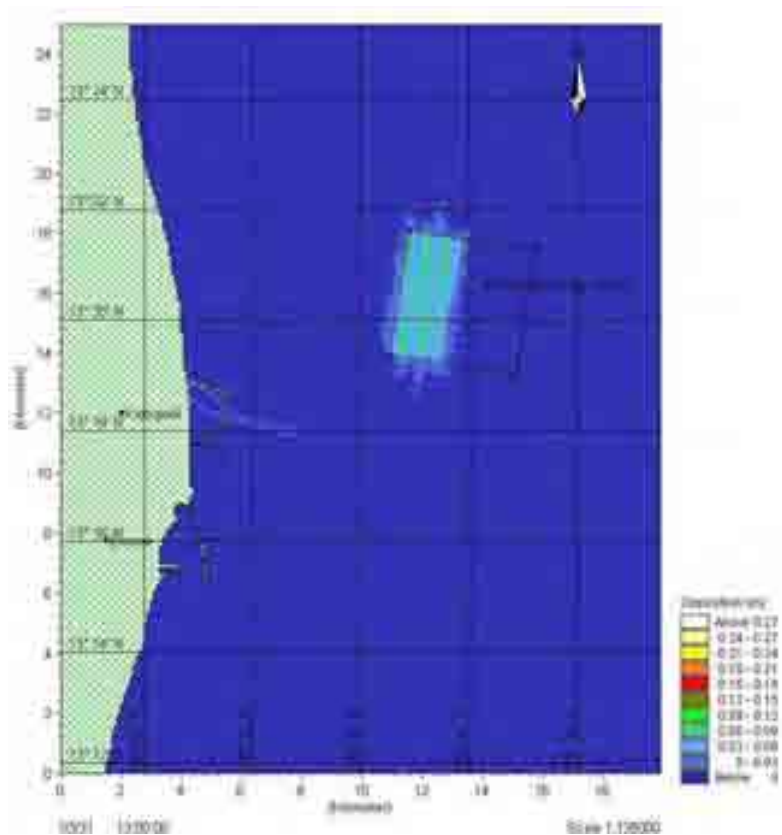


Figure 3-19: Deposition pattern for PA Run # 3 (observed currents (S); coarse sediments; Kattupalli dumping during October)

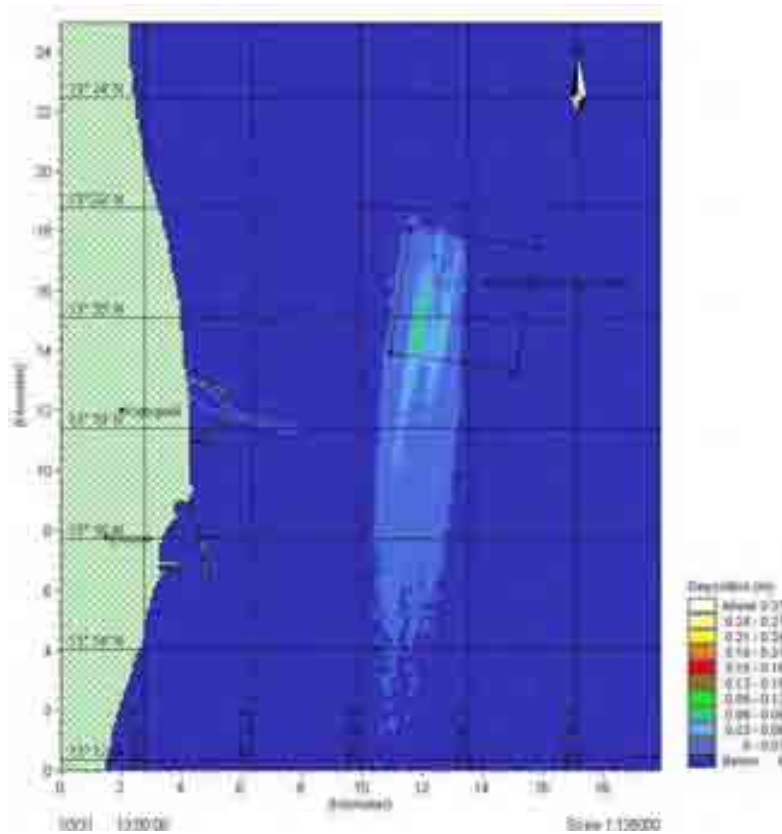


Figure 3-20: Deposition pattern for PA Run # 5 (strong currents (S); coarse sediments; Kattupalli dumping during November, December and January)

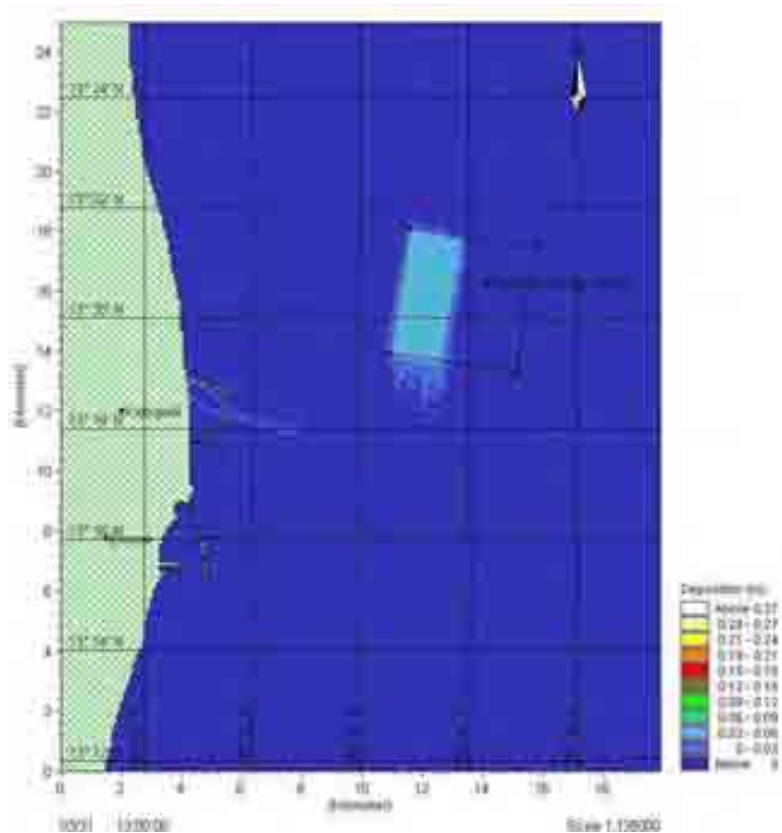


Figure 3-21: Deposition pattern for PA Run # 6 (observed current (S); coarse sediments; Kattupalli dumping during November, December and January)

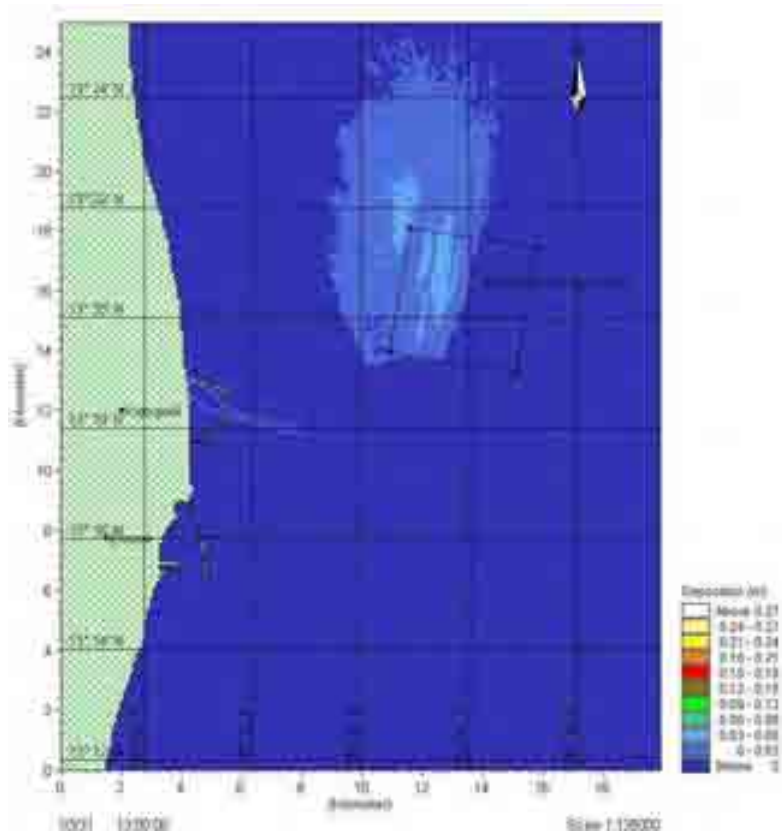


Figure 3-22: Deposition pattern for PA Run # 7 (observed current (N); fine sediments; Kattupalli dumping during May - August)

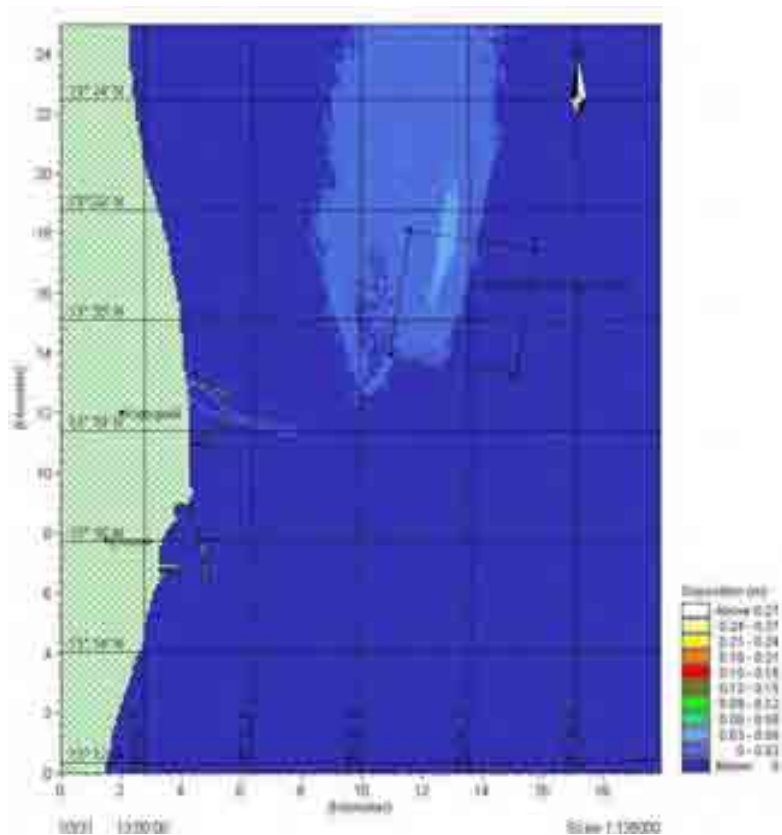


Figure 3-23: Deposition pattern for PA Run # 8 (strong current (N); fine sediments; Kattupalli dumping during May - August)

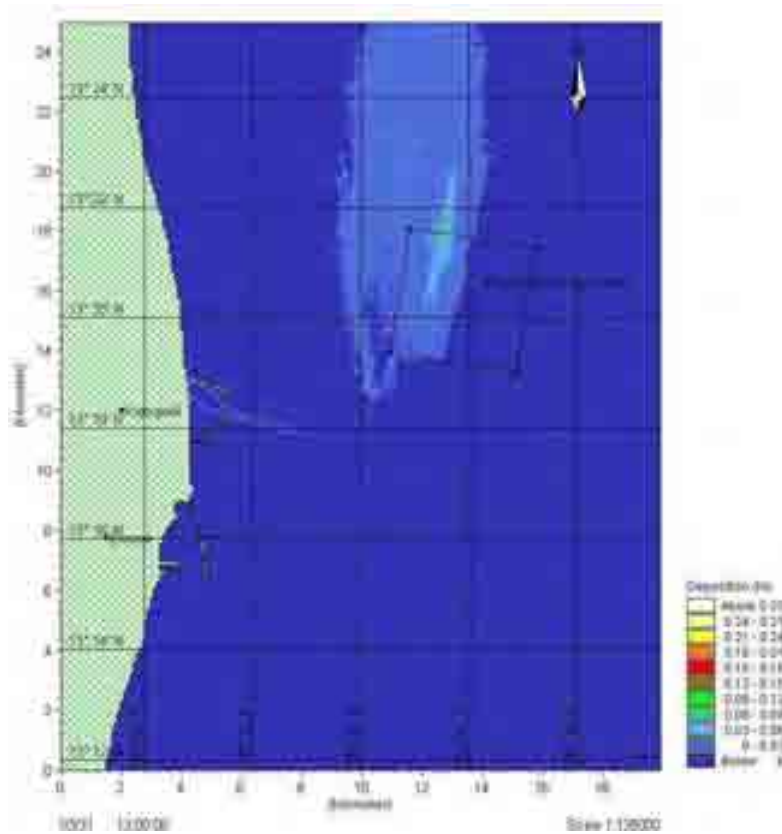


Figure 3-24: Deposition pattern for PA Run # 9 (strong current (N); fine sediments; Kattupalli dumping during September)

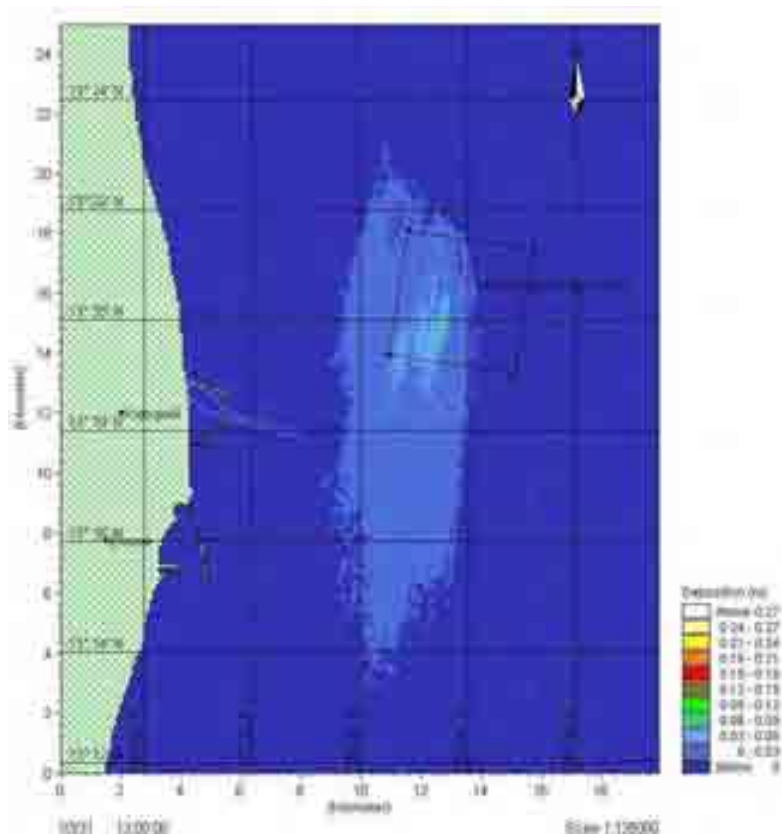


Figure 3-25: Deposition pattern for PA Run # 11 (strong current (S); fine sediments; Kattupalli dumping during October)

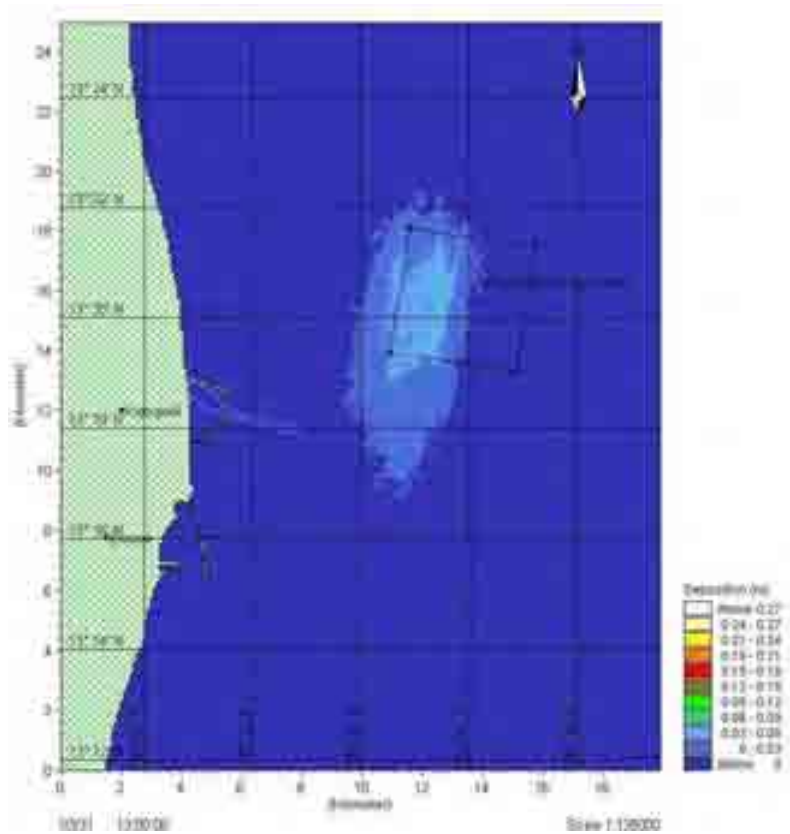


Figure 3-26: Deposition pattern for PA Run # 12 (observed current (S); fine sediments; Kattupalli dumping during October)

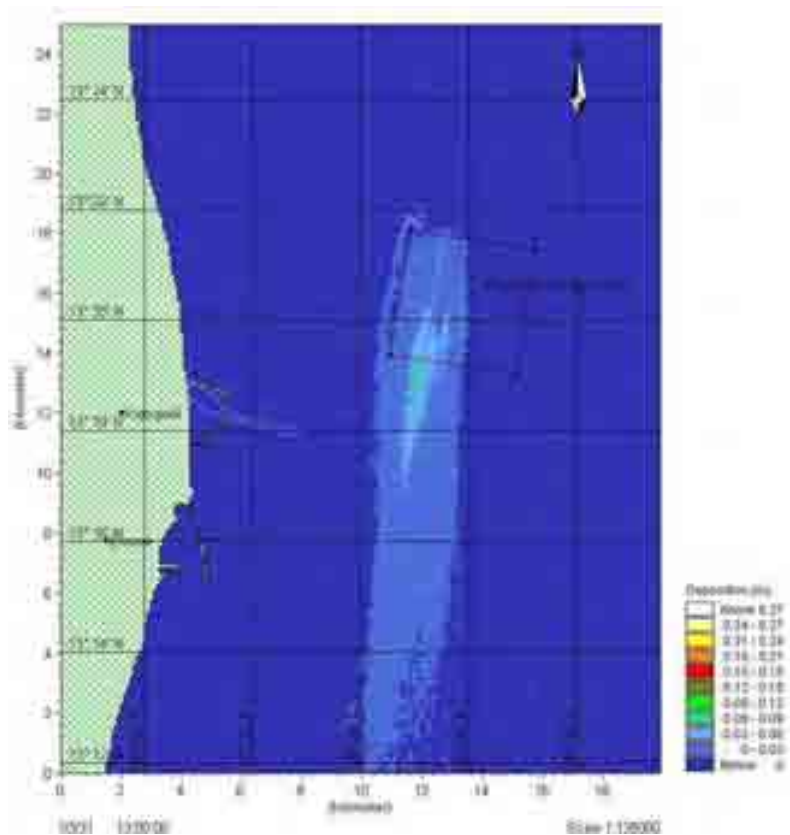


Figure 3-27: Deposition pattern for PA Run # 13 (strong current (S); fine sediments; Kattupalli dumping during November, December and January)

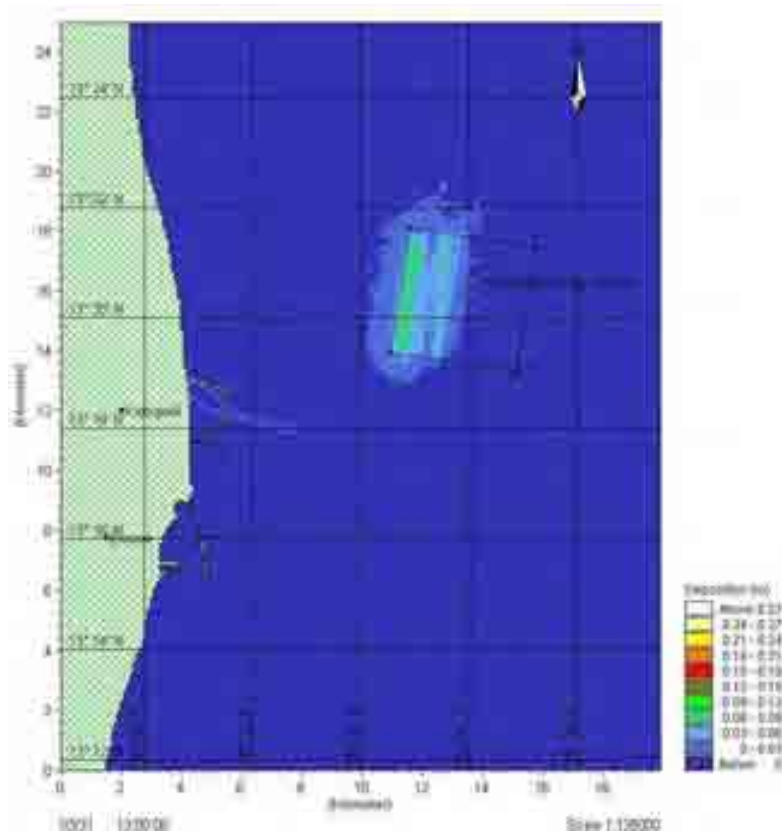


Figure 3-28: Deposition pattern for PA Run # 15 (weak current (S); fine sediments; Kattupalli dumping during February to April)

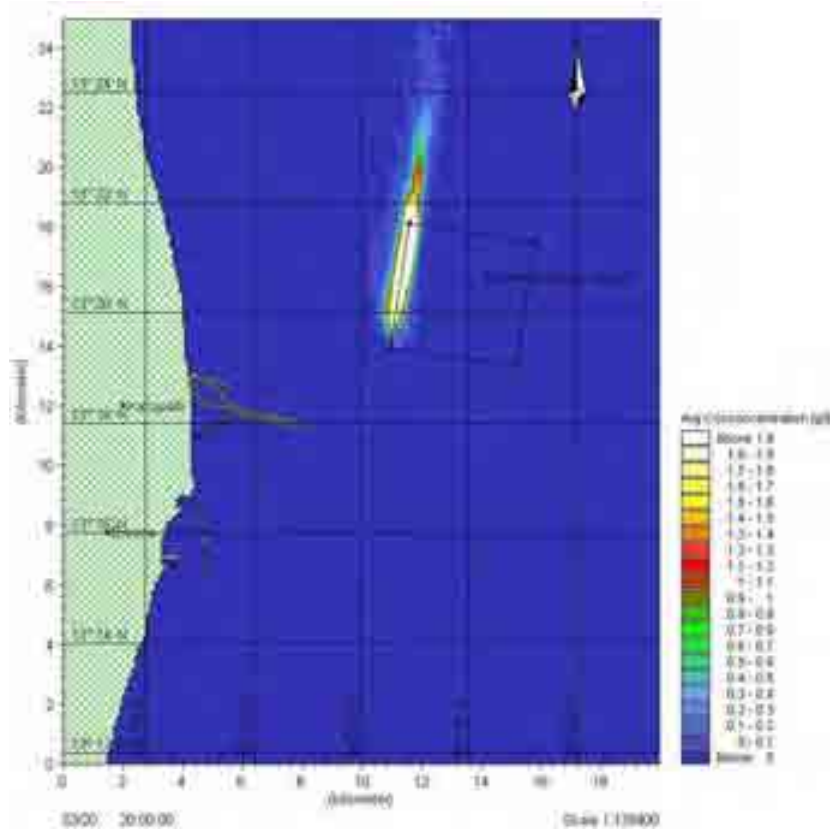


Figure 3-29: Averaged Concentration for PA Run # 1 (strong current (N); coarse sediments; Kattupalli dumping during May - August) immediately after dumping

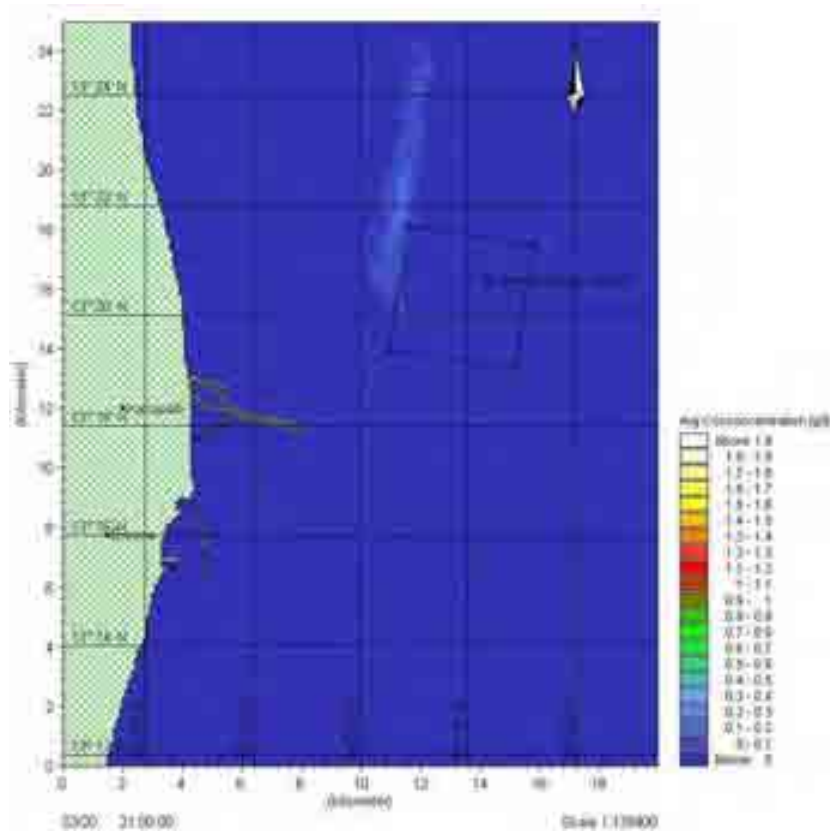


Figure 3-30: Averaged Concentration for PA Run # 1 (strong current (N); coarse sediments 1 hour after dumping)

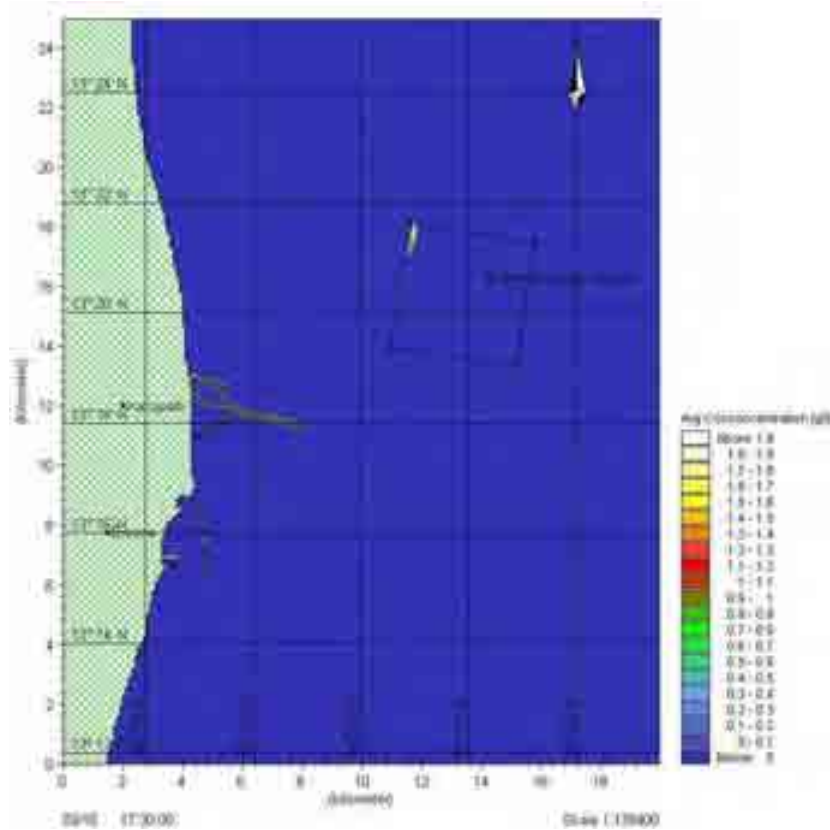


Figure 3-31: Averaged Concentration for PA Run # 3 (observed current (S); coarse sediments; Kattupalli dumping during October)

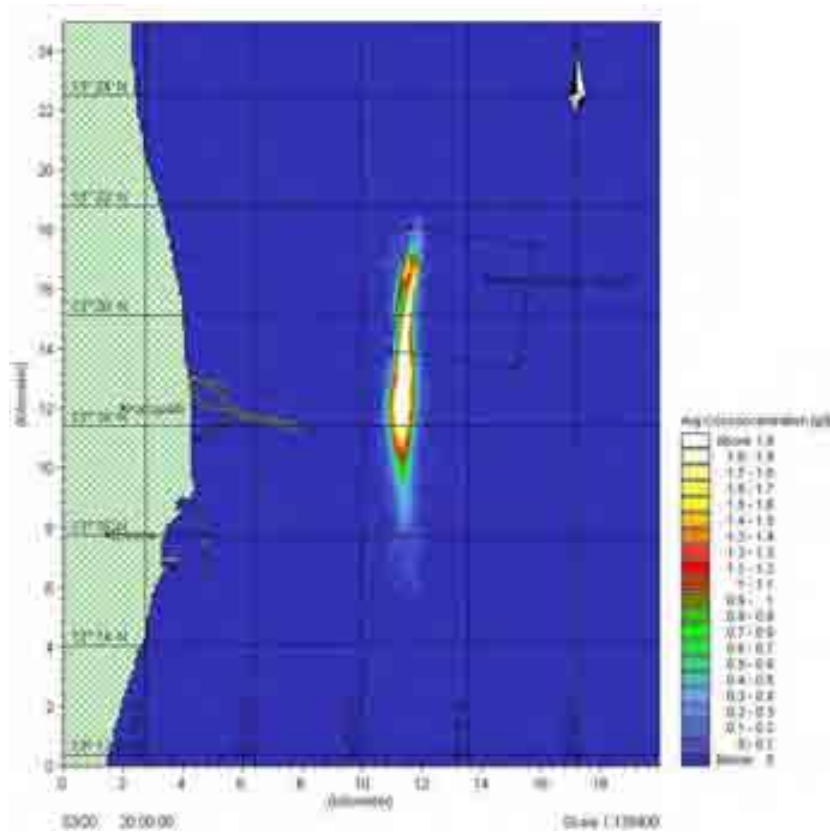


Figure 3-32: Averaged Concentration for PA Run # 4 (strong current (S); coarse sediments; Kattupalli dumping during October)

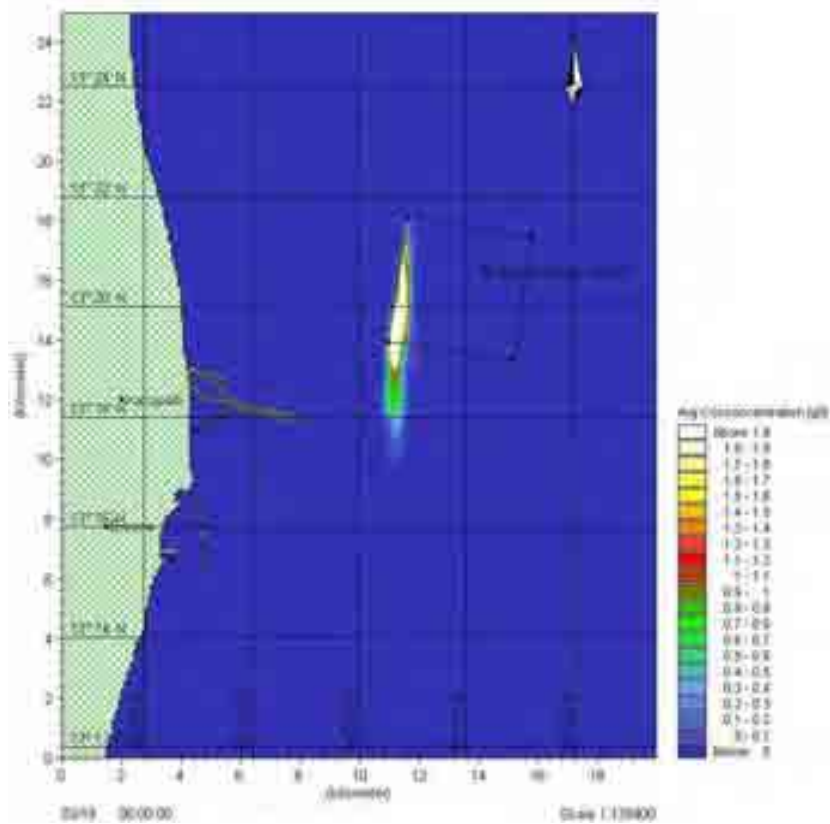


Figure 3-33: Averaged Concentration for PA Run # 5 (strong current (S); coarse sediments; Kattupalli dumping during November, December and January)

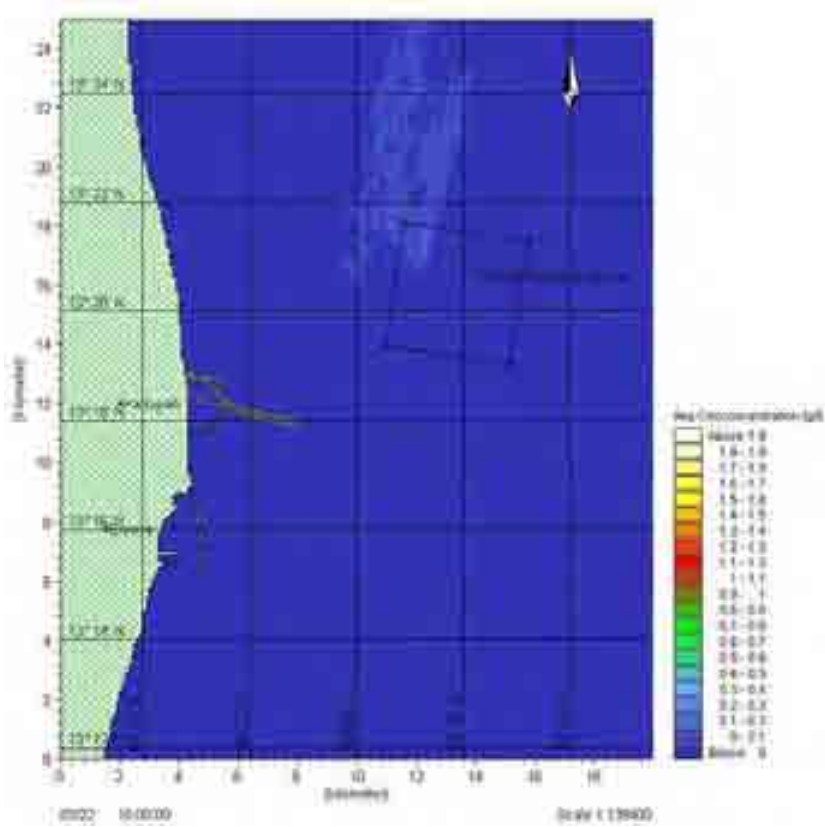


Figure 3-34: Averaged Concentration for PA Run # 8 (strong current (N); fine sediments; 1.5 hours after dumping)

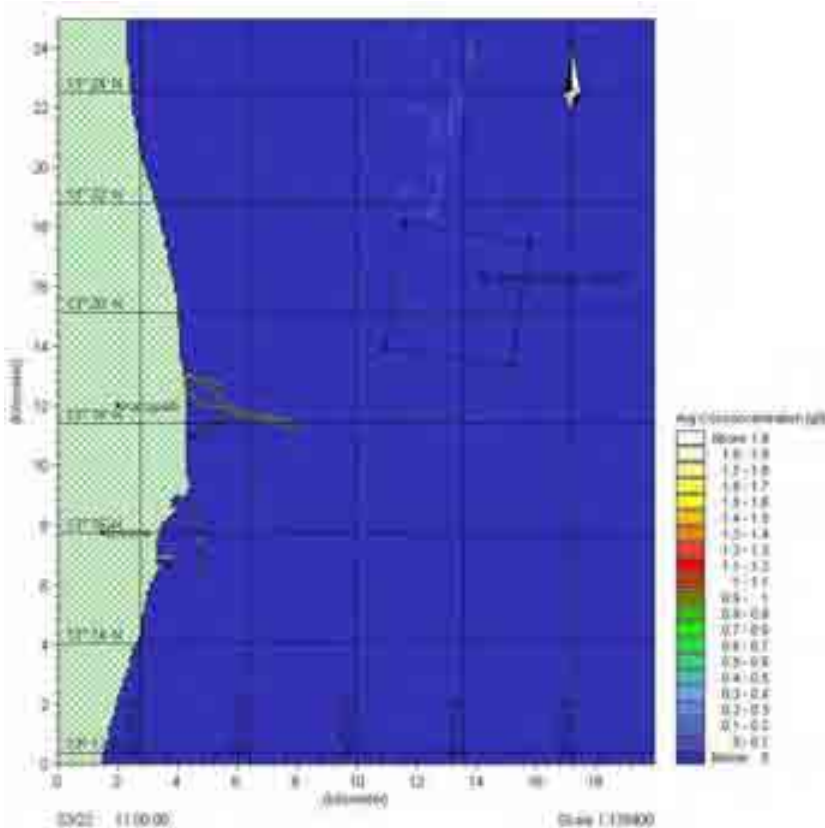


Figure 3-35: Averaged Concentration for PA Run # 8 (strong current (N); fine sediments; 2.5 hours after dumping)

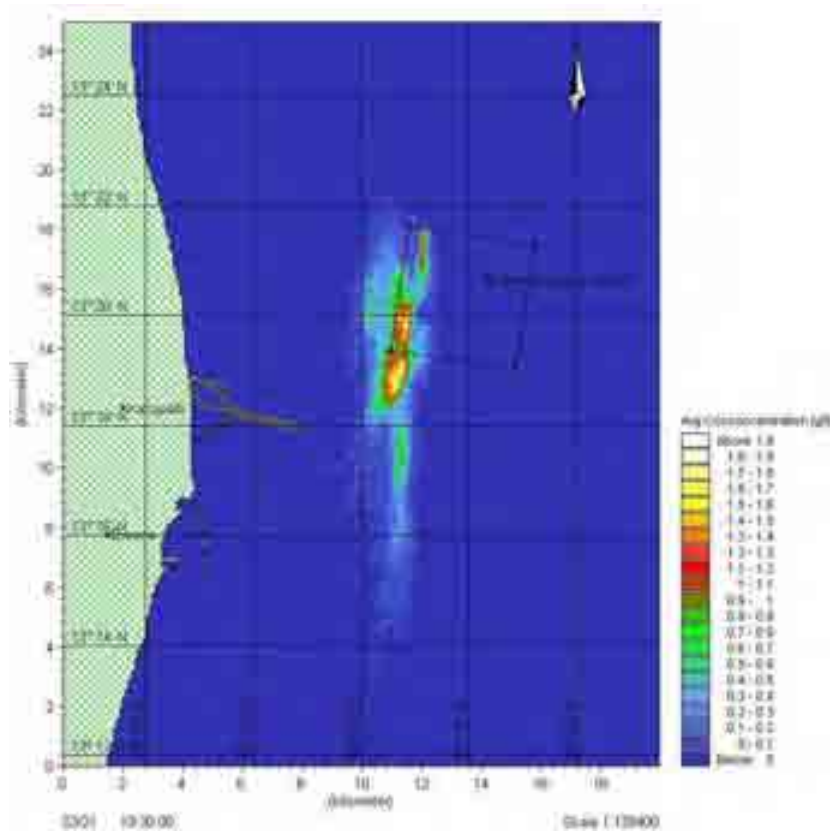


Figure 3-36: Averaged Concentration for PA Run # 11 (strong current (S); coarse sediments; Kattupalli dumping during October)

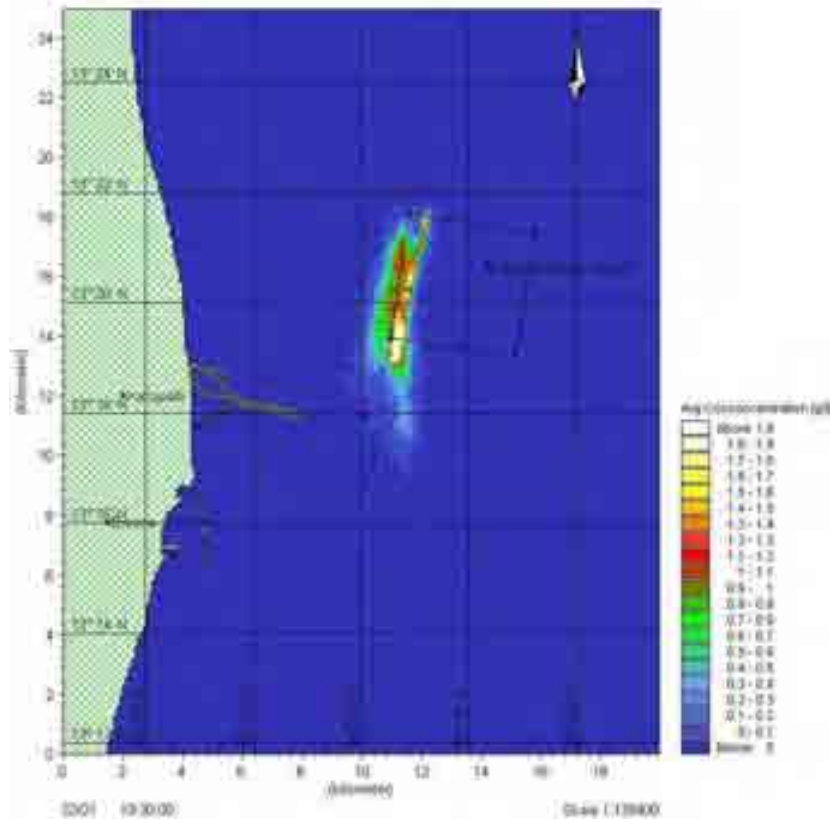


Figure 3-37: Averaged Concentration for PA Run # 12 (observed current (S); fine sediments; Kattupalli dumping during October)

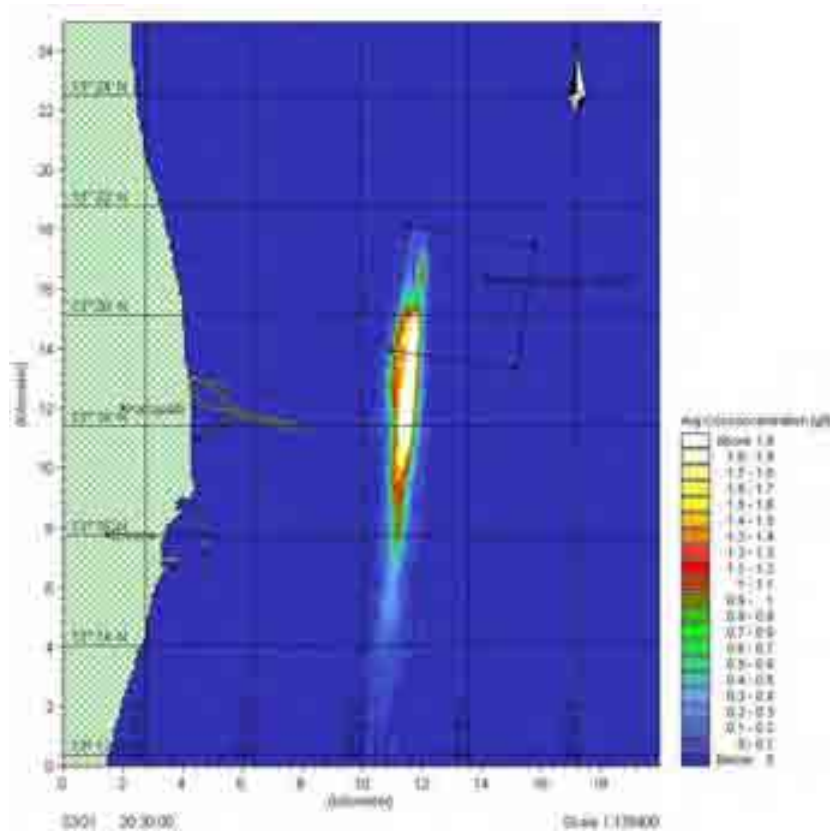


Figure 3-38: Averaged Concentration for PA Run # 13 (strong current (S); fine sediments; Kattupalli dumping during November, December and January)

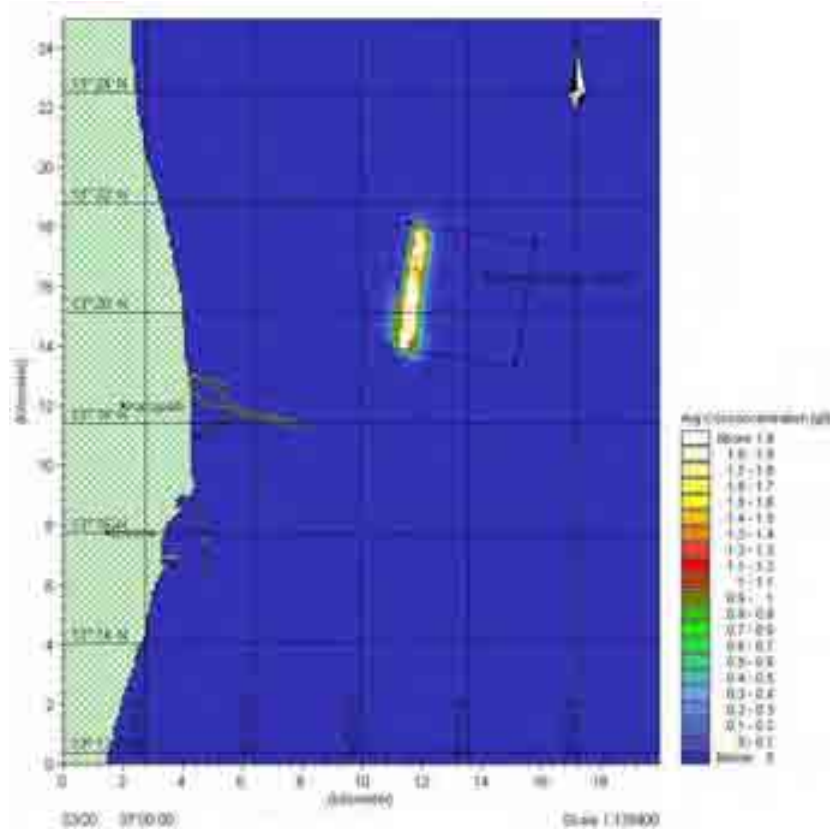


Figure 3-39: Averaged Concentration for PA Run # 15 (weak current (S); coarse sediments; Kattupalli dumping during February - April)

3.6 Summary and Conclusion

The dredge spoil disposal study has been carried out for Kattupalli Port under a combination of environment scenarios prevailing in the study domain. Hydrodynamics of the study domain is validated using the observed current measurements at the site. All other environmental scenarios were simulated by applying appropriate scaling to the observed conditions.

The fate of dumped dredge spoil is studied using the PA module of MIKE 21 with underlying hydrodynamic flow. Two types of sediments, one with less silt content and the other with more silt and clay content, were used for the study. The coarse materials, which comprise the major portion of the dumped sediments, settle within dumping ground with thickness less than 0.3m for observed currents. The averaged sediment concentration is found to be reaching ambient value within 2.5 hours after dumping. The sediment plume traverses a path almost parallel to the coast either towards north or south depending on the prevailing flow conditions. Influence of wind is noticed only for the finer sediments which try to push the sediments more towards the coast.

It is observed that northerly transport is blocked by the Pulicat shoals which prevent the sediments from reaching the shore. There is no spreading of dredge spoil towards the navigation channel of Kattupalli Port or the coastline due to the dumping of dredged spoil at Kattupalli dumping ground.

4 Anticipated Impacts and Mitigation Measures

4.1 Pre and Post Dumping Marine Environment at Disposal Site

4.1.1 Marine Water Quality

Table 4-1: Marine Water Physico-chemical Parameters

Marine Water Physico-chemical Parameters	Units	Pre Dumping (March 2008)	Post Dumping (2012)	
			Minimum	Maximum
Temp.	°C	30.0	27.5	31.5
Salinity	ppt	32.0	29	34
pH		8.1	7.8	8.3
TSS	mg/l	69.2	6.8	196.0
Turbidity	NTU	-	1	15
DO	mg/l	4.650	4.121	6.232
BOD	mg/l	0.641	0.080	2.448
Water Oil and Grease	µg/L	0.165	0.045	1.000

Table 4-2: Marine water Nutrient Parameters

Marine water Nutrient Parameters	Units	Pre Dumping (March 2008)	Post Dumping (2012)	
			Minimum	Maximum
NO ₂	µmol/L	0.151	0.057	3.581
NO ₃		1.68	2.302	12.911
NH ₄		0.021	0.008	0.249
TN		12.723	8.551	39.055
IP		0.37	0.038	1.18
TP		1.75	0.123	2.384

Marine water Nutrient Parameters	Units	Pre Dumping (March 2008)	Post Dumping (2012)	
			Minimum	Maximum
SiO ₃		2.68	0.298	24.221

4.1.2 Sediment Quality

Table 4-3: Sediment Soil Parameters

Sediment Parameters	Units	Pre Dumping (March 2008)	Post Dumping (2012)	
			Minimum	Maximum
Texture				
Sand	%	78.23	26.7	96.56
Silt		15.7	2.89	62.19
Clay		6.07	0.5	33.01
Total Organic Carbon	mg/g	3.767	1.346	9.315
pH		-	6.4	8.64
Sediment Oil and Grease	µg/g	1.21	28	4346

Table 4-4: Sediment Heavy Metals

Sediment Heavy Metals	Units	Pre Dumping (March 2008)	Post Dumping (2012)	
			Minimum	Maximum
Cd	µg/g	0.52	0.12	1.5
Cu		91.36	2.902	22.239
Pb		13.72	2.507	26.2
Zn		15.64	3.696	21.32
Hg		0.041	0.004	0.036

4.1.3 Marine Ecology (Phyto Plankton, Zoo Plankton and Benthos)

Table 4-5: Biological Parameters

Biological Parameters	Units	Pre Dumping (March 2008)	Post Dumping (2012)	
			Minimum	Maximum
Primary Productivity	mgC/m ³ /hr	58.63	6.464	125.324
Chl a	mg/m ³	4.11	0.174	15.223
Phaeopigment	mg/m ³	3.847	0.025	8.852
Total Biomass	ml/100m ³	31.2	7.619	257.62
Phytoplankton	No/l	40933	822	225418
Total Number of Species		35	15	55
Zooplankton	Nos/m ³	18644	1903	53988
Total Number of Species		28	14	35
Fish Egg	Nos/m ³	68	1	87
Total Number of Species		12	1	17
Fish Larvae	Nos/m ³	1	1	17
Total Number of Species		1	1	4
Macrobenthos	No/m ²	275	1200	3250
Total Number of Species		5	24	67
Meiobenthos	No/10cm ²	123	394	3207

Biological Parameters	Units	Pre Dumping (March 2008)	Post Dumping (2012)	
			Minimum	Maximum
Total Number of Species		21	66	123

4.1.4 Observations:

Analysis of Pre and Post Dumping marine environmental parameters of the dumping site reveals that there is no significant Change in the marine water quality, Sediment and Biological parameters of the disposal site.

4.2 Impacts associated with Dumping

4.2.1 Disposal Material Quality

Marine soil quality analysis of the material to be dredged/dumped has been carried out. Analyses were done to study the quality of the material to be dumped in terms of its toxic metals. Analyses were done for the following metals: Cadmium, Mercury, Copper, Lead, Iron and Zinc. Results of the analysis show that the concentration of the toxic metals in the material to be dumped is at lower concentrations. Hence, based on this analysis, the material can be safely disposed in the selected offshore dumping location. Results of the analysis are provided in **Table 4-6**.

Table 4-6: Marine Sediment Quality Analysis

S. No	Name of the Metals	Minimum Concentration ($\mu\text{g/g}$)	Maximum Concentration ($\mu\text{g/g}$)
1.	Cadmium	1.30	5.32
2.	Mercury (ng/g)	0.03	0.05
3.	Copper	21.40	31.98
4.	Lead	26.60	39.12
5.	Zinc	20.44	47.96

4.2.2 Impact on Marine Water Quality

Marine water quality will be impacted due to disposal; direct impact of these activities on marine water quality would be increased turbidity due to suspended sediment.

Turbidity due to dumping operation varies with depth and lateral distance from the dumping location. During dumping, transport of sediment depends on velocity and fine material concentration. Very fine cohesive material will remain in suspension for a long time and is independent of hydrodynamic conditions. Due to above factors, there will be an increase in turbidity due to suspended sediment in water column. Thus, it can be inferred that dumping can cause a short-term and localised impact on marine water quality.

Apart from turbidity, the marine water quality may be affected due to aqueous discharge (oily wastes, sanitary wastes, etc.) from the dredgers, barges and workboats involved in the activities. No discharge from the dredgers or work boats shall be allowed into marine waters. The dumping activity will be confined within the dumping site and the impact due to dumping will cease upon completion.

4.2.3 Impact on Marine Ecology

Offshore dumping dredged material will result in disturbance to marine ecology.

Turbulence – Changes in Dissolved Oxygen (DO) Levels: During dumping, oxygen-demanding compounds, nutrients and sediments enter into water column. Since

concentrations of oxygen-demanding compounds are normally much higher in pore water than in water column it will cause a drop in oxygen concentration. Nutrients may stimulate primary production when light and temperatures are sufficient and may cause eutrophication problems when released in favourable conditions. Changes in DO levels and noise are likely to result in localised and short-term impacts on marine ecology.

Impact on Benthic Communities associated with Bottom Sediments: During dumping, sessile forms in sediments will be covered with dump material and mobile species tend to move away and are likely to increase species diversity in areas adjoining dredging site.

Smothering Effect Due to Settling of Sediment: Settlement of the suspended sediments can result in the smothering or blanketing of benthic communities. Presently, the marine biota in Indian Coast is already subjected to considerable changes in turbidity due to large-scale littoral movement, which is a recurring regular natural phenomenon. Therefore, it would be able to withstand localised turbidity induced during the dumping.

4.3 Mitigation Measures

- A schedule for dredging/dumping shall be prepared and list of DO (s) and DONOT (s) shall be circulated among the people involved in construction activities
- It is proposed to check turbidity levels with baseline turbidity levels as a reference during dredging/dumping.
- The dredged spoil shall be disposed off uniformly throughout the Spoil disposal area during the period of the dredging activities
- Dumping activity will be regulated during rough sea conditions
- It will be ensured that barges / workboats have slop tanks for collection of liquid / solid waste generated on board. Discharge of wastes into sea will be prohibited.
- Spill control measures will be adopted while fuelling dredgers, barges, workboats, etc.
- Post dumping monitoring program will be carried out to assess effect of disposal on marine ecology
- Environmental Monitoring Programme comprising of monitoring of marine water quality, marine sediment quality and marine ecology shall be initiated one week prior to commencement of dredging and will be carried out throughout dredging/dumping period.



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